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ORIGINAL MEMOIRS.

SUBTEMPORAL DECOMPRESSIVE OPERATIONS FOR THE INTRACRANIAL COMPLICATIONS ASSOCIATED WITH BURSTING FRACTURES OF THE SKULL.*

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DEFINITE rules of procedure in the treatment of fractures which involve the cranial vault are to be found in the earliest medical writings and with but little modification have been accepted as a part of our modern practice. These precepts are chiefly concerned with the reduction of deformations of the skull which have resulted from fragmentation of one sort or another at the pole of impact.

It is otherwise with fractures involving the cranial base: for beyond an ice-cap, recumbency and free evacuation of the bowels, the surgeon's attitude toward these patients, if he is interested at all, lies in the making of a diagnosis to determine if possible into which fossa the lines of fracture have run; in the observing of symptoms to see if, by chance, there is a "free interval," interpreted as an indication of meningeal

* Read before the Southern Surgical and Gynæcological Association, New Orleans, Dec., 1907.

hemorrhage; and in the giving of a prognosis which, according to Bergmann's dictum, is good—for life, though not necessarily for subsequent health—if the patient survives the first two days following the injury.

As a matter of fact, though we speak of a well-recognized class of injuries as fractures of the base—a term which conjures up a definite clinical picture—the fracture itself is of practically no importance whatsoever; there is no dislocation of fragments, owing to the pull of muscles as elsewhere on the skeleton; the cracks, which indeed may often be very difficult to find post mortem, unite promptly if life is spared, and so far as the bony injury is concerned no active measures are needed. Injuries, however, of such a character that they lead to a bursting fracture, with meridional fissures which radiate into the base, almost invariably produce serious symptoms from an accompanying lesion or lesions of the brain.

Is there any more or less routine method of intervention which can promptly be utilized to meet the intracranial symptoms which accompany these basal fractures, in the presence of which surgeons usually adopt a waiting policy?

Without entering into the controversy as to what is concussion and how its manifestations and anatomical lesions differ from those of contusion, it may be said that the symptoms of most of these cases are brought about by an increase of intracranial pressure, whether *immediate* from free extravasation due to the laceration of cortical vessels, *intermediate,* often with a "free interval" of consciousness, when an extravasation outside of the dura slowly augments in size, or *late,* often a matter of a few days, when cerebral œdema occurs. In many cases, indeed, the symptoms of these various conditions shade imperceptibly into one another.

The phenomena of compression are so well understood that they need not be detailed; the slowed pulse, the rise in blood-pressure, the headache, vomiting, and choked disc are seen in their most typical guise in these cases. Particularly have we found that the condition of the eye-grounds is most helpful in recognizing an advancing process, and the presence

of free extravasation in the subdural spaces, as is well known, can easily be determined by a lumbar puncture.

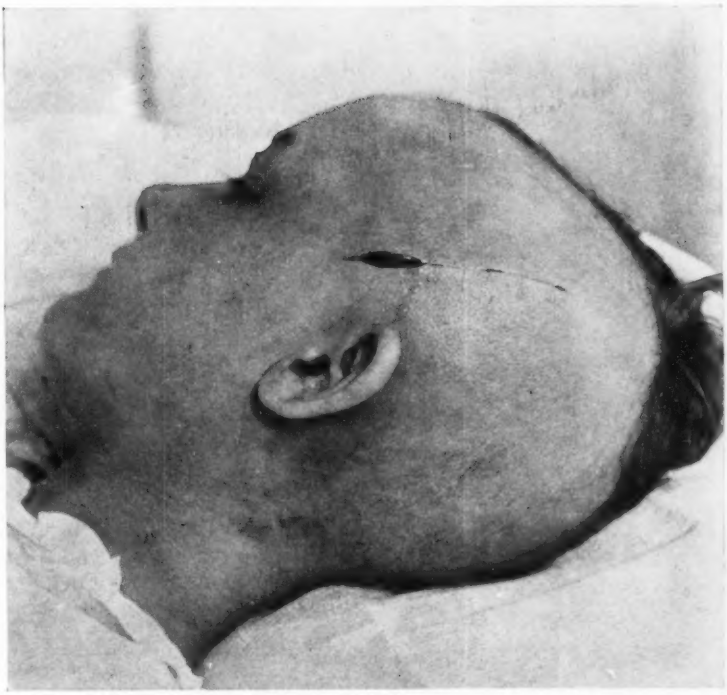
During the past three years in a fairly large series of cases we have followed the routine of making a subtemporal exploration through a split-muscle incision combined with a subtemporal decompression—namely, the removal of a circle of the thin bone, about 4½ cm. in diameter, from under the muscle, together with a dural opening. Contrary to our former high mortality in cases of basal fracture—about fifty per cent.—we have only lost two out of our last fifteen cases, both of these due to the fact that a unilateral exploration alone was performed, and an extensive extravasation—extradural in one case, subdural in the other—on the opposite side of the head was overlooked.

The advantages of the procedure, in addition to its simplicity, may be summarized as follows: (1) The approach is made through the thinnest available part of the skull. (2) The opening is made under the temporal muscle, the fibres of which are split and not divided, so that, when closed, they serve to prevent too great bulging, if the tension tends to make the brain herniate, and serve also to prevent a subsequent obtrusive depression when the normal conditions have been restored. A subsequent defect in this situation is absolutely harmless. (3) In case there has been a rupture of the meningeal or of one of its branches the extradural clot is certainly brought into view by this opening, and as the meningeal trunk is exposed the vessel can be easily ligated. (4) In all bursting fractures accompanied by laceration of the brain it is the tips of the temporal and base of the frontal lobes which most frequently suffer, and a subdural extravasation from this source can most readily be dealt with through an opening in this situation. (5) In a large proportion of bursting fractures the lines of fracture seek out the mid-cranial fossa, and hence free bleeding from the base can be most easily drained through the temporal fossa by protective drains placed under the temporal lobes. (6) The subsequent œdema and swelling of the brain, which is an almost invariable sequel of any serious

cerebral contusion and which is responsible in many cases for the pressure symptoms during the first two weeks, can be best combated by an opening in this situation under the muscle. (7) Aside from the prompt subsidence of the acute symptoms which are often seen after these operations, they appear to lessen many of the unpleasant late sequels—traumatic neuroses—which are so often a feature of the cases which have recovered without operation.

I believe, in view of our experience with this simple operation—which, in so far as the approach to the cranial chamber is concerned, differs from the subtemporal decompressive operation for tumors only in the obliquely vertical (Fig. 1) instead of curvilinear direction of the scalp incision—that less risk is run even in the milder or border-line cases by a prompt exploration and decompression, than in waiting for nature to take her own course in absorbing extravasations and œdema in an unopened skull.

FIG. 1.



Bursting fracture of the skull from fall on left frontal region, with compression symptoms: operation on the third day. Removal of bone under temporal muscle through intermuscular incision disclosed thin extradural clot, subdural extravasation, laceration of temporal lobe and œdematous brain with excess of bloody cerebrospinal fluid under tension. Protective drain from below temporal lobe.

Photograph taken at first dressing forty-eight hours after operation, when sutures and drain were removed. To show line of incision and situation of drain.

OSTEOPLASTIC RESECTION OF THE SKULL,

WITH DESCRIPTION OF A MODIFICATION OF STELLWAGEN'S INSTRUMENT FOR PERFORMING THIS OPERATION.*

BY ALFRED C. WOOD, M.D.,

OF PHILADELPHIA,

Assistant Professor of Surgery in the University of Pennsylvania; Surgeon to the University, Philadelphia and St. Timothy's Hospitals.

AMONG the notable advances in surgery in recent years, intracranial operations occupy a prominent place. This fact is due largely to the development of the osteoplastic method of exposing the brain and its membranes. Wagner, who has the credit of first performing this operation in 1889 employed the chisel and mallet to cut through the skull. The value of this method of exposing the brain was at once recognized by surgeons, and almost immediately suggestions of new instruments to replace the chisel and mallet in effecting the bone section began to appear, and have continued, at frequent intervals, up to the present time. Without reviewing the discussion as to the relative merits of the original method, and the numerous substitutes that have been recommended, which is now an old story, it may be confidently stated that the chisel and mallet are employed less frequently each year in the operation now under consideration.

At the present time, the rivalry is chiefly between bone-cutting instruments and saws driven by power,—usually electricity,—and certain cutting forceps and instruments manipulated entirely by the hands.

It is not the purpose of this report to open a controversy on the relative merits of these two general methods of procedure. It will be admitted at the outset that each has its well-defined field of usefulness, as have also a number of the different instruments that have been described. Nothing can be more trite than the statement that an instrument that one surgeon will use with facility and satisfaction will be

* Read before the Philadelphia Academy of Surgery, February 3, 1908.

considered wholly inappropriate under identical circumstances by another operator. I have, therefore, no arguments to advance against any of the methods that have been successful in other hands. I desire, merely, to describe an instrument that has been eminently satisfactory to me, and one, I believe, that deserves a trial from those who have not felt satisfied with the methods they have heretofore employed.

In 1903 Dr. Thomas C. Stellwagen, Jr., of this city, devised an instrument for cutting an osteoplastic flap of the scalp and skull. Shortly thereafter I had the opportunity of assisting Professor J. William White in some cases of osteoplastic resection of the skull in which he used this instrument, and subsequently employed it in two or three cases in my own service. I was surprised at the ease with which the bone flap was cut, and although the instrument accomplished the object for which it was intended it seemed to me susceptible of improvement in certain minor features. The first objection encountered in this limited experience was the severe tax on the pronator and supinator muscles of the forearm, which, being unaccustomed to prolonged efforts of this kind, became very tired, so that it was necessary to rest from time to time. The second objection from my standpoint, was the lack of security of the plate upon which the shaft of the instrument revolved. In spite of every effort I could make it would soon become loose * and had to be held by the fingers of the left hand, or by an assistant, whose hand in the vicinity of the wound, was usually more or less in the way and impeded the progress of the operation. A third objection was the free hemorrhage from the vessels of the scalp while the bone was being cut through. While hemorrhage from a scalp incision is always copious, and requires the application of a large number of hæmostatic forceps, the sweep of this instrument made the use of the forceps impossible and the well-

* Dr. Stellwagen informs me that he has since adopted the use of wood screws which overcome this difficulty. However, I prefer the modification here described as this instrument has a fewer number of parts and less time is consumed in establishing the central point or base.

known difficulty of tying the scalp vessels results in a great loss of time. This last objection was overcome to some extent, theoretically, by some operators, by cutting a short segment of the flap at a time, and sawing through the subjacent bone, then enlarging the scalp incision and the bone section, part by part, until the necessary flap was formed. My own observation leads me to say that the total amount of bleeding which occurred when this method was employed was just as great as when the whole flap was cut at once and in addition the time required to change from the knife to the saw and back again, and the extra time required in forming the flap, prolong the operation unnecessarily.

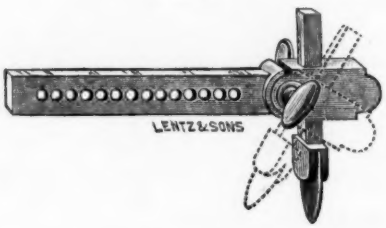
To overcome the first difficulty mentioned, it occurred to me that by attaching a handle to the end of the arm carrying the saw, the force required in cutting the bone could be applied more comfortably, that is, in a way that would be much less tiresome to the operator. This addition to the instrument required the shaft to turn freely upon the handle instead of being fixed as in the original model. Further, as both hands were required to operate the instrument, an effort was made to do away with the base plate which had been a source of inconvenience as already stated.

In my first model all of the features of the Stellwagen instrument were retained. To these were added the handle at the end of the arm, the rotating shaft armed with a spear-pointed pin at the end opposite the handle, which bored a hole in the skull as the shaft rotated, and thus became fixed. A shoulder at the junction of the shaft with the pin prevented the latter from penetrating too deeply and injuring the membranes of the brain. Motion was provided at the joint between the arm and the shaft, otherwise it would be necessary to incline the shaft at various angles, as the saw swept over the irregular surface of the skull, and as it penetrated the bone. In order to combine both ideas in one instrument it was necessary to have means: first, to fix the shaft rigidly to handle; and second, to fix the arm firmly to the shaft,—when used

in the original way. To meet the requirements in the other case, both of these points must be freely movable.

Subsequently, the idea of retaining all of the original features was abandoned, as the instrument was thus unnecessarily complicated and further experience with the modified form led me to feel that in the latter, all of the requirements were fully met. An effort was made at first to cut the skull obliquely rather than perpendicularly, in order that, when the operation was completed and the skull flap returned, it would be supported by the bevelled edge of the section and would thus be prevented from becoming displaced inward. With this object in view, in the first model, the clamp at the outer end of the arm in which the saw was secured was arranged so that the latter could be adjusted at any angle

FIG. 1.



desired (see Fig. 1.). After a little experience this feature was omitted, as the perpendicular section is, I believe, in every way satisfactory. The theoretical preference for the formation of a support for the bone flap must be admitted, but I have never observed any tendency of the fragment of bone to become displaced inward, nor do I recall having heard of such a complication.

The drill-pointed pin at the end of the shaft which did not give satisfaction was substituted by a blunt pin, and a separate drill was provided.

The various parts of the instrument are shown in Fig. 2, and are as follows:

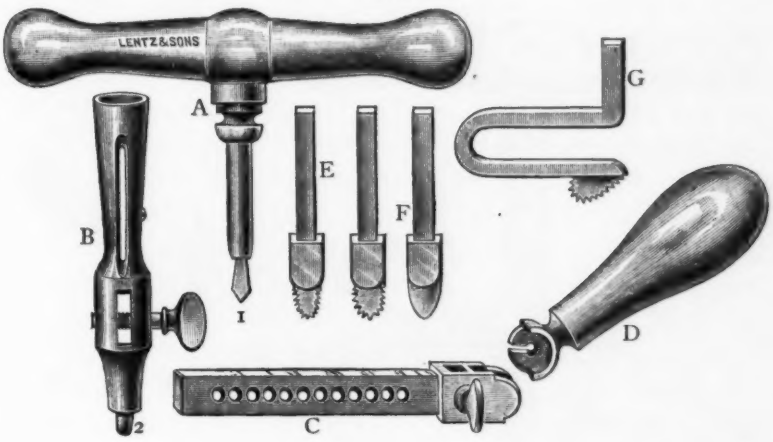
1. A T-handle (A), armed with a bone drill (1).
2. A shaft (B), to which the handle is adjusted, provided

with a fenestra to accommodate the radial arm, and a blunt centre-pin at the end (2). The handle is held to the shaft by a spring, but is instantly released by slight traction.

3. A radial arm (C) which is received in the fenestra in the shaft, and is secured by a thumb screw. The knife and saw are carried at the outer end of this arm and are held by a set screw.

4. A radial arm handle (D), to be adjusted to the extremity of the arm, and used to give the circular motion to the knife and saw. The arm is graduated in inches and centi-

FIG. 2.



metres so that it may be instantly adjusted to cut an opening of the desired size.

5. Knife and saws (E, F, G).

The saw (G) is designed to cut the base of the bone flap by carefully raising the pericranium and scalp along the proposed saw line. The sawing must be done very deliberately in order not to detach the scalp from the body of the bone flap.

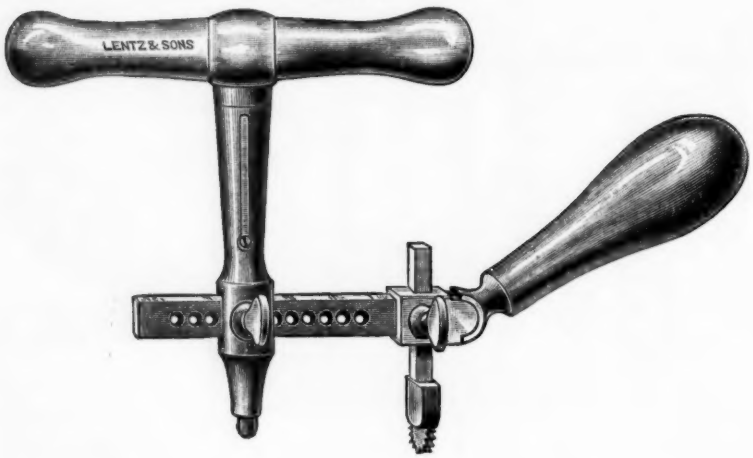
Fig. 3 shows the instrument assembled ready for use.

The operation with this instrument is carried out as follows:

The head is prepared in the usual way. The fissure of Rolando, the fissure of Sylvius, or any intracranial landmark

desired as a guide at the operation should be marked upon the scalp. After the patient is anæsthetized, important points may be scratched with the point of a scalpel and the entire scalp may again be cleansed with alcohol and bichloride solution. The size of the circle required to expose the area of brain which it is desired to inspect, is determined and the central point marked by scratching an " X " on the scalp with the point of a knife. The radial arm should now be adjusted by the scale to cut a circle of the desired size. When all is ready, a half-inch incision is made in the scalp at the central

FIG. 3.



point (X), the handle, carrying the drill, is then removed from the shaft by slight traction, and a hole bored in the skull at the centre of this incision. The drill is prevented from going through and injuring the membranes by a shoulder. The handle is then replaced in the shaft and the knife inserted in the outer end of the arm where it is secured by the set screw. The T-handle is held in the left hand, the arm handle is applied to the end of the arm and held in the right hand, while the pin at the end of the shaft is introduced into the hole bored in the skull. The scalp flap is now cut, down to the bone, usually by a single sweep of the knife, which should

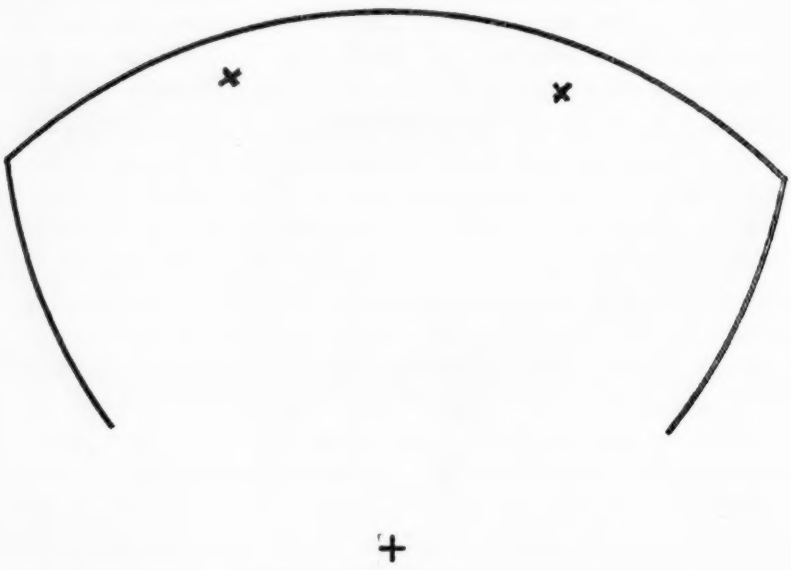
be introduced at the point at which it is desired to begin the incision, and carried around to the point at which it should end, forming two-thirds or three-fourths of a circle. During this manœuvre, as the scalp is freely movable on the skull, an assistant should steady the former and make traction against the pull of the knife, so that the flap shall not be distorted. The knife is then replaced by the saw and the bone cut by moving the saw forward and backward by means of the handle held in the right hand. The saw may be made to traverse the entire length of the incision in either direction with one sweep, but it will usually be found more convenient to cover about one-half of this distance. The saw is so constructed that it cuts equally well in either direction; it is guarded by a shoulder, the blade is scant 3/16 inch long so that it may be used freely without danger of wounding the dura. If the skull is unusually thick at any point the saw may fail to cut entirely through, but no difficulty will be found in prying up the bone flap if two narrow chisels be employed. If the bone has not been cut entirely through at any point, a little edge will be left, which may be cut away with rongeur forceps, or may be allowed to remain to support the flap when it is returned. This support may always be obtained, if desired, by leaving one or more points where the inner table is not entirely sawed through. After the bone section is complete, the base may be sawed through (under the dura) or the bone may be pried up by two chisels, thus breaking the base of the bone flap. No special comment is needed as to the incision in the dura, which is made according to the usual rules.

Two points in connection with the use of the instrument require special mention. First, in placing the radial arm in the shaft, be particular to see that the proper face is uppermost, otherwise the arm handle cannot be adjusted. Second, when sawing the bone, the shaft should be kept perpendicular to the skull, for, if inclined, the saw will be carried in the same direction. After a groove has been cut in the skull, if the saw does not tend to follow this track it will be because the

position of the handle has changed. A very little manipulation will again bring the saw in its proper position.

If a larger exposure of the brain is desired than is afforded by the circular flap a somewhat rectangular flap may be made by cutting the segments of three circles of the required size. Fig. 4 illustrates this idea. The " X's " indicate the three centre points used to form this flap. Many variations in size and shape are possible.

FIG. 4.



I have employed this instrument in a number of cases with very great satisfaction. Its use does not tire the muscles at all, it is easily manipulated by any one, it is absolutely safe, and it cuts rapidly. The whole time required to expose the brain has not been observed, but in a number of instances the time has been taken from the moment I began to saw the bone until the flap of scalp and bone was turned up and the dura exposed. The longest period required was eight minutes, and the shortest, one minute and fifty seconds. The latter was in a man about 35 years of age, the flap being three and

one-half inches in diameter. With a little practice this part of the operation should be done easily in from three to four minutes, the hole for the centre pin may be made in from one-half to one minute and the scalp should be cut in a minute. Thus in the absence of complications the whole operation of opening the skull need not consume more than from five to six minutes. The very short time consumed in the operation results in a marked decrease in the amount of blood lost, and as soon as the flap is raised forceps may be applied or other measures adopted to prevent further hemorrhage from the scalp wound.

Among those for whom I have operated, and who have witnessed the use of this instrument are: Drs. Charles K. Mills, William G. Spiller, M. Howard Fussell, Charles S. Potts, T. H. Weisenberg, J. H. W. Rhein and S. Ross Crothers.

I believe the following claims may be made for this instrument.

1. It enables one to cut an osteoplastic flap of the skull quickly and safely.

2. No injury can possibly be done. The careless or clumsy use of the instrument can do no harm.

3. Every part may be sterilized by boiling.

4. It is always ready for use as there are no complicated parts to get out of order.

5. It is complete in itself and does not depend upon electric currents, motors, assistants, or anything but the hands of the operator.

ATLO-OCCIPITAL DISLOCATION.

A CASE OF FRACTURE OF THE ATLAS AND AXIS, AND FORWARD DISLOCATION OF THE OCCIPUT ON THE SPINAL COLUMN, LIFE BEING MAINTAINED FOR THIRTY-FOUR HOURS AND FORTY MINUTES BY ARTIFICIAL RESPIRATION, DURING WHICH A LAMINECTOMY WAS PERFORMED UPON THE THIRD CERVICAL VERTEBRA.

BY N. J. BLACKWOOD, M.D.,

Surgeon, U. S. Navy.

At 1.05 P.M., Sept. 18, 1907, the patient G. F. G., Ordinary Seaman, U. S. N., aged 19 years and 3 months, was doing some gymnastic exercises on the gun deck of the U. S. S. New Jersey, and while attempting the trick known as "cutting off," his hands slipped, and he fell to the deck, a distance of about four feet, landing on the right side of his head, the weight of his body being above and his head and neck bent underneath. He was immediately picked up by his companions and carried down to the sick bay, as he was unable to walk and apparently unconscious. He was at once seen by the medical officer on duty, who finding him cyanotic and gasping for breath immediately started artificial respiration. Upon examination the following condition was discovered:

Complete paralysis both motor and sensory, from the line of the larynx down. Muscles were flaccid, with no rigidity anywhere, and no constrained position assumed by any of the extremities. All reflexes were lost and remained so while life lasted, with the single exception of the plantar reflex which returned very slightly about five hours after the accident. Priapism was present within the first half hour and remained constant until death supervened. There was an involuntary evacuation of the bowels within the first fifteen minutes, but no passage of urine, which had to be withdrawn with a catheter.

Patient was perfectly conscious during the whole period of life, hearing and understanding everything that was said to him, replying either by winking the eyes, noddings and shakings of the head, or when air was being forced through the larynx, by a few spoken words. At all times he could move his lips

and tongue, forming words, but no articulate sound could be made, except when aided by very forcible pressure on the chest walls. The paralysis of respiration was complete, and as far as could be discovered there was no organ below the larynx that was performing its normal functions with the single exception of the heart. In attempting to breathe there would be frequent tracheal tugs, and the tongue would be protruded and the face screwed up whenever the patient tried to swallow. There was no sense of thirst or hunger, and after a little water had been given the patient by means of a medicine dropper, he refused to take anything which had to be swallowed. Contrary to the expectation and as naturally follows in breathing through the mouth, there was no dryness of the tongue and fauces but they appeared to be always moist. When first seen and when the efforts of the patient to breathe were most pronounced there appeared to be a narrowing of the fauces, caused by a protrusion of the posterior wall. The eyes were at first closed, and on opening them there was an external strabismus and the pupils were reduced to pin points, both of which conditions improved until the eyes became almost normal, responding to light and at all times were symmetrical.

At first the heart was almost inaudible and very slow and the patient was pulseless but under the influence of artificial respiration and cardiac stimulants the strength increased and the beats reached 72, being full and strong but irregular and intermittent, sometimes dropping two or three and at other times giving an abortive beat.

Patient at no time seemed to suffer from pain, but on being questioned said " my head hurts." The body surface temperature was good at first but later fell and had to be maintained by the application of hot water bottles. There did not seem to be any area of hyperæsthesia or any marked degree of sweating in any part until on the second day the body sweat so that it was thought that there had been an evacuation of urine. A careful examination of the spinal column in the cervical region revealed no dislocation as far as the spinous processes were concerned, but there seemed to be an unusual depression between the atlas and the base of the occiput. Believing that this might be a dislocation an attempt was made by extension and counter extension with manipulation of the cervical vertebra, to effect a reduction, but

with no permanent results or improvement in the general condition.

As all the symptoms pointed to an injury at or above the third cervical vertebra, as nothing so far had effected any relief of the symptoms, and as the patient was only kept alive by means of artificial respiration, which could not be continued indefinitely, it was decided, in the hope that perhaps there was not a complete transverse lesion of the cord, to do a laminectomy on the third cervical vertebra, and to relieve any pressure which might exist either as the result of hemorrhage, fracture, dislocation or spicule of bone which had penetrated the spinal cord. The question then arose as to how to operate on the back of a patient's neck, who must be on his back in order to receive artificial respiration. It was suggested that he might be put on his side and unilateral respiratory movements be made or on his back and pressure exerted on his back. He was accordingly turned on his side, and artificial respiration applied with one arm, which seemed to supply a certain amount of air, but the patient's color soon showed that he was not getting sufficient. He was then turned on his face, his forehead and chin being supported by hard pillows. What was our surprise to hear him gasp, and the artificial respiratory movements being stopped, the patient began to breathe, the diaphragm performing the work alone. In this position and in this way the patient continued to breathe for seven minutes, when he gradually became cyanotic and ceased breathing, and he was immediately put on his back and artificial respiration recommenced.

It was therefore decided that the operation must be done with the patient on his back, if it was to be done at all. The field of operation was then prepared in the usual way and an aseptic towel placed about the head to act as a sling. The patient was placed on the table with the head and neck extending beyond the end and supported by a nurse holding the sling. One nurse was on each side of the table, each having an arm and doing the usual motions for artificial respiration. The operator on a low stool had to work much as a fresco painter does when painting a ceiling. It was found that by slightly elevating the head, the field of operation was better exposed, but also the bending of the neck cut off the passage of air to the lungs to a certain extent, and every few minutes the head had to be lowered to the horizon-

tal position and artificial respiration applied more vigorously. With these frequent interruptions the operation required much more time than it would ordinarily do, as can well be imagined. Of course no anæsthetic could be given by inhalation and as all sensation was lost from the middle of the neck down it was only necessary to inject some cocaine solution, to destroy the sensation in the small part of the field of operation that was still supplied with active nerve influences. The patient was perfectly conscious during the whole operation and felt absolutely no pain. The operation was begun about 11.30 P.M. and completed at 1.50 A.M. It is not necessary to describe the various steps of the operation as they are well known to all. The spinous processes and laminæ being exposed, no fracture could be felt but there seemed to be increased lateral motion of the atlas and the dislocation of the occiput forward on the spinal column was very evident, but all attempts to reduce it and have it remain in position failed. The spinous process and laminæ of the third cervical vertebra were removed and the membranes of the cord exposed. Aside from the fact that there was a slight congestion these appeared to be perfectly normal and were not disturbed. Patient stood the operation well, and except for a little extra stimulation on account of the heart action, he required no special treatment, and showed no ill effects. But no good results were noticed. He continued in the same condition until about 10. A.M. of the 19th, when he vomited a bile stained fluid; 800 c.c. of urine were drawn off, and at 11 A.M. he vomited again. About noon there appeared some blood stained moisture on the sheet under the patient, and it was feared there might be some recurrent hemorrhage from the wound. This was examined and found in perfect condition, clean, dry and healthy, and it was then discovered that the moisture on the sheet was caused by most profuse sweating of the patient's body.

During the afternoon patient had several sinking attacks when he became pulseless and could only be revived by heroic efforts. He remained conscious up to the last except during these syncopal attacks, but the heart grew gradually weaker responding less and less to stimulation and he finally died at 11.45 P.M., September 19th.

A postmortem was held at 10 A.M., Sept. 20th, ten and a quarter hours after death, and the following condition found:

The occiput was dislocated forward on the spinal column, and the cord nipped between the posterior edge of the foramen magnum and the posterior surface of the odontoid process of the axis. The atlas was fractured in three places, twice laterally just at the point of attachment of the transverse or check ligament, and once posteriorly. The odontoid process was broken off short on a line with the superior articular surface of the axis. The membranes of the cord were intact, but the cord itself was reduced to a pulpy mass from the level of the foramen magnum to the interval between the axis and the third cervical vertebra.

From the disclosures at the postmortem we are convinced that nothing could have been done to save the patient's life, and the wonder is that he should have lived so long. Had it not been for the prompt action of Assistant Surgeon M. H. Ames, U. S. N., in starting artificial respiration and the untiring efforts of the corps of nurses and assistants in administering the same, this would have been one of the cases of practically instantaneous death that are so common with a broken neck.

Medical literature is full of reports of cases of fracture, dislocations of the vertebra, and discussions of the symptoms, treatment and prognosis of spinal injuries, but in a most careful search, we have been able to find but one reported case similar to our own, as to location and character of fracture, when artificial respiration was carried on for three and a half hours, and no case under similar conditions where an operation was performed or life prolonged for so many hours. We are therefore led to believe that the case is unique, and report it as such. There are many observations which it would have been most interesting to make, but which were rendered practically impossible by the conditions, and the small chance of taking observations for fear of interfering with the artificial respiration.

FRACTURE THROUGH THE ANATOMICAL NECK OF THE HUMERUS WITH DISLOCATION OF THE HEAD.

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FRACTURES through the anatomical neck of the humerus, associated with dislocation of the head, present features so distinctive in the mechanism of their production, in their pathology, in their amenability to external treatment, and in the nature of their operative treatment, as to place them in a class by themselves.

Fifty years before the Christian era, Pasticrates treated of fracture-dislocation at the shoulder-joint; but no case of fracture of the anatomical neck with dislocation is recorded prior to 1823, when Delpech reported the case observed by Houzelot in 1808. It has thus been exactly a century since this injury has been recognized as a distinct entity; and even to the present time, it has been treated in literature only in connection with other fracture-dislocations at the shoulder. This is not to be wondered at, when it is considered that, so far, only 34 undoubted cases have been recorded. If to these are added 9 unverified cases, the number still is small for a definite lesion whose history extends over a hundred years.

The present paper is concerned with the report of a typical case, under the author's care, with a résumé of the other cases on record, and a consideration of the mechanism of the injury and the methods of treatment.

AUTHOR'S CASE.—On June 14, 1907, Mrs. O., 58 years of age, tripped on a plank, while walking on sloping ground, and pitched forward, falling full length. She is unable to say just how her arm and shoulder met the ground, but she was certain at the time, that very great violence had been sustained. Her physician, Dr. Hamilton, was summoned and made a diagnosis of

dislocation of the shoulder. He at once placed her under the influence of chloroform and made efforts at reduction. After several trials these efforts appeared to be successful and the arm was bandaged to the chest wall. Pain of the most persistent and severe character, extending down the arm, continued for the next sixteen days, at the expiration of which time the author saw the patient in consultation.

The ordinary signs of dislocation were not present. The rotundity of the shoulder was almost completely preserved. The elbow could be applied to the chest wall and the hand placed on the opposite shoulder. The tuberosities could be felt to rotate under the acromion when the shaft of the humerus was turned on its axis. No crepitus could be elicited. Although the usual signs of dislocation and fracture were absent, the persistent pain and helplessness of the limb indicated a serious injury and rendered an X-ray examination advisable.

The next day the plate represented by Fig. 1 was made by Dr. R. H. Boggs of this city, and it became at once evident that there existed a fracture of the anatomical neck with subglenoid or axillary dislocation of the head.

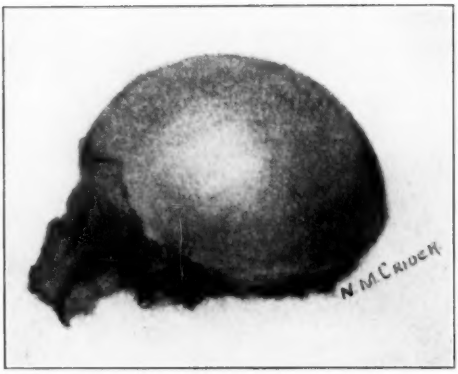
Operation.—On July 4th (20 days after injury), at Columbia Hospital, the patient was anæsthetized and an incision made along the lower border of the anterior axillary fold. This was deepened till the axillary vessels and nerves were reached. These were found to stretch tightly over the underlying dislocated head, which was firmly embedded in the soft tissues. To a portion of the circumference of the neck was still attached the capsular ligament, and so firmly was the head held under the vessels that efforts to displace it were without avail and it seemed that it would be impossible to dislodge it, without injury to the overlying vessels. By cutting the shreds of capsule from its periphery and by patient manipulation of the vessels, and strong traction with lion-jawed forceps, the head (Fig. 2) was finally extracted. The wound healed without reaction and the patient returned to her home in two weeks.

She was examined on December 31st (about six months after injury) and the following condition found: Arm of normal appearance. Very little wasting. Arm hangs naturally to side. Unaided abduction of arm possible only to extent of about 45 degrees. By passive movements, the arm can easily be brought

FIG. 1.

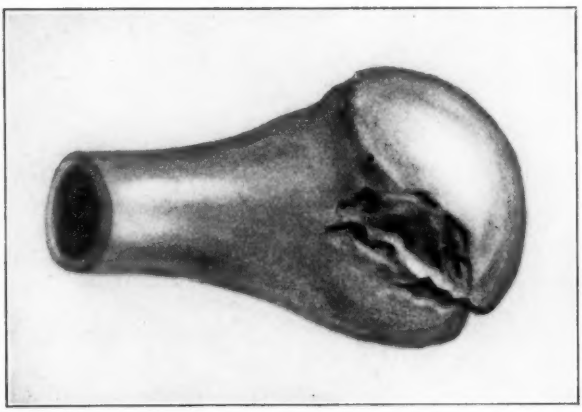
Fracture of anatomical neck of the humerus, with subglenoid dislocation of the head.

FIG. 2.



Fractured and dislocated head of humerus after removal by operation.

FIG. 3.



Dislocation of humerus with indentation of the anatomical neck. (Caird.)

almost to horizontal. All the movements of forearm, normal and swinging movements of limb satisfactory. Use of arm much improved in last three months. Patient has much neuralgic pain extending along the course of the median nerve. This is no doubt due to a neuritis from pressure of the head prior to removal.

CASES RECORDED IN THE LITERATURE.*

The cases of this injury, so far reported, may be separated into three groups: (1) Clinical cases verified by operation or autopsy; (2) Clinical cases not so verified, but depending for their diagnosis on the opinion of the attending surgeons; (3) Specimens without clinical history.

I. Clinical Cases Verified By Operation or Autopsy.

(29 in all)

A.—Cases not Subjected to Operation.

(12 in number)

1. Houzelot (1808) (reported by Delpech).—Injury was the result of a fall from a stroke of apoplexy. Posterior dislocation of head.

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*The following cognate injuries are not included in the present account; but the histories of all such cases have been examined to assure the completeness of the regular list.

1. Pertubercular fractures with dislocation.

2. Fractures of "the neck" with dislocation, in which no definite statement is made by the reporter, as to line of fracture.

3. Fracture of surgical neck with dislocation.

4. Incomplete or impacted fractures of anatomical neck with dislocation (4 cases—Anger, Bennett, Maxwell, Heilberg).

5. Fractures of neck produced by futile efforts at reduction of dislocation.

6. Cases in which union had occurred in a fracture-dislocation of the anatomical neck and subsequent operation was done (two cases):

Tansini (La Riforma Med., Napoli, 1897, xiii, Pt. 2, 173) in a man of 44 years, resected 8 cm. of the upper end of the luxated humerus, which showed an united fracture of the anatomical neck.

Royster (Journal Amer. Med. Assoc., 1907, xlix, 487) in a boy of 20 years, replaced by open incision a subcoracoid luxation of a humerus, in which "close inspection revealed a line of callus formation, and deformity, indicating a healed fracture through the anatomical neck of the humerus." The outcome of the case was most gratifying.

Perhaps the six cases in groups 4 and 6 belong more properly in the regular list; but a careful study of the original reports has induced the author to place them in classes by themselves.

Patient died in twelve days. Autopsy. *Thamhayn*: *Inaug. Dissert. Ueber die mit Fractur des Collum Humer. complicirten Schulter Luxationen, No.* 26.

2. TRAVERS (1823).—Fall. Head dislocated into axilla. Both tuberosities separated from shaft and drawn in opposite directions. Death months later. Autopsy. *London Med. Repository*, 1823, xx, 222. *Gurlt. Handbuch der Lehre, von den Knochenbruchen, Obs.* 97, p. 696.

3. LALLEMAND (1827).—Fall of 12 or 15 feet. Head dislocated under clavicle. Additional fracture of greater tuberosity. Efforts at reduction futile. Death from Erysipelas in 38 days. Autopsy. *Oger. (A) Etude sur Les luxations scapulo-humerales compliquees de fracture de la partie superieure de l'humerus. Paris*, 1884. No. 52.

4. HEALE (1835).—Man of 60 years. Efforts to reduce on the second day failed. Death 15 months later. Autopsy. *Thamhayn, loc. cit.* No. 25.

5. COOPER (1824).—Fall from a horse. Failure of efforts to reduce. Autopsy many years later. *Guy's Hosp. Rep.* 1839, iv, 273.

6. KEY (1839).—Man of 63. Tripped at head of stairs and fell with outstretched arm and rolled to bottom, striking his shoulder violently on the way. Death in three months. Autopsy showed fracture of anatomical neck, also united fractures of six pieces "close to the neck," with subglenoid luxation of the head. *Guy's Hosp. Rep.* 1840, v. 92.

7. MALGAIGNE (1840).—Patient seen about six weeks after injury. Cause of injury unknown. Died with suppuration two months after injury. Autopsy showed fracture of both anatomical and surgical neck with dislocation of head. *Malgaigne*: *Traite des fractures et des luxations*, Paris, 1855, p. 547.

8. MANZINI (1840).—Man of 57 years. Fracture of both anatomical neck and surgical neck and forward dislocation of head. Efforts at reduction unsuccessful. Death two months later; suppuration. Autopsy. *Thamhayn, loc. cit.* No. 31.

9. LENOIR (1851).—Fat woman of 83 years. Fell from heat of sun with oustretched arm. Fracture of both anatomical and surgical neck. No effort made to reduce head of bone. Died of apoplexy, after consolidation. *Oger, loc. cit.* No. 53.

10. SURGEON TO MANCHESTER ROYAL INFIRMARY (1852).—Man of 58 years. Fell from a height and "pitched on his shoulder." Fracture of anatomical neck and one just below the surgical neck, with luxation of the head into the pectoral muscle. Death on the sixth day from gastric hemorrhage from ulcer. Autopsy. *Provincial Med. and Surg. Jour.*, 1852, 267.

11. ST. THOMAS' HOSPITAL MUSEUM (reported 1861).—History of a fall from a horse many years before. *Trans. Path. Soc. London*, 1861, xii, 188. *Gurlt. loc. cit.* Obs. 116, p. 705.

12. MABBOUX (1877).—Adult male. Fall from horse. Luxation of head into axilla. Death in thirty days. Autopsy. *Poirier et Mauclaire*: *Revue de Chirurgie, Oct.* 1892. iv, p. 849.

B.—Cases in Which the Head Was Excised.

(14 in number)

1. Morton (1884).—Man of 73. Fall down stairs. Head freely movable in axilla. Vigorous efforts at reduction unsuccessful. Head excised. Patient ready for dismissal in 13 days, when he had an attack of diarrhœa from which he died one week later. *Am. J. Med. Sci.*, 1884, lxxxvii, 173.

2. Poirier (1889).—Man of 37. Fall with hand carried forward. Shoulder did not touch the ground. Head luxated into the axilla. Efforts at reduction without avail. Head removed by incision. Very good use of the arm resulted. Arm could be brought to horizontal; other movements satisfactory. *Poirier et Mauclaire, loc. cit., Obs.* v, p. 849.

3. Croft (1889).—Patient 33 years old. Fall through a trap-door eighteen feet. Subglenoid dislocation of head. Ineffectual efforts to reduce under chloroform. Head removed by incision three days after injury. Moderately good result. *Lancet*, 1890, i, 701.

4. Clutton (1892).—Woman 61 years old. Luxation of head into axilla. Head removed eight days after injury by incision. Head lifted out without the use of a knife or scissors. Excellent result. *Souchon. Transact. Amer. Surg. Assoc.*, 1897, xv, 330.

5. Poirier et Mauclaire (1892).—Man of 63. Fell on his shoulder on the partition of a coal-bin. Efforts at reduction failed. Incision and removal of head twenty-four days later. *Poirier et Mauclaire, loc. cit. Obs. vi.*

6. McGraw (1896).—Man of 45. Head luxated into axilla. Operation four weeks later. Three inch incision made through deltoid, through which it was impossible to reach the head. Axillary incision then made, and removal of head with difficulty, it being firmly held between capsule and bone. Excellent result. *Souchon, loc. cit.* 331.

7. Gerster (1897).—Man of 47. Fall from car on outstretched arm. Open incision and removal of head one month after injury. Vessels and nerves stretched over head. Death from infection. Annals of Surgery, 1897, xxvii, 660.

8. Salmon (1899).—Fall down stairs. Head luxated into axilla. Head excised 11 weeks after injury. *Medical Council, Phila.*, 1900, v, 134.

9. Curtis (1899).—Man of 29. Fell in a "fit" and struck his shoulder. Subcoracoid luxation. Operation 21 days after injury. Incision along margin of deltoid. Head easily removed. Good result. Annals of Surgery, 1900, xxxi, 295.

10. Brigham (1899).—Man of 34. Thrown from a buggy in a runaway, falling on the palm of his hand. Five months later, head was removed through incision along border of pectoralis major. Head had united to shaft. Good result. Annals of Surgery, 1900, xxxi, 614.

11. Jepson (1899).—Man of 48. Knocked down by a carriage. Intracoracoid luxation of head. Removal of head. Good result. *Western Med. Rev.*, 1900, v, 297.

12. DOLLINGER (1902).—Excision of head probably done. Particulars scanty. *Centralbl. f. Chir.* 1902, xxix, 1277.

13. KEEN (1905).—Man of 60. Fall on the shoulder. Subcoracoid luxation with reversal of head. Head removed 5½ weeks later. Very adherent. Care necessary to avoid injury to vessels and nerves. Good result. ANNALS OF SURGERY, 1907, xlv, 945.

14. BUCHANAN (1907).—Case above reported.

C.—Cases in Which the Head was Returned to the Glenoid Cavity.

(3 in number)

1. WÖLFLER (1890).—Male adult. Recent dislocation. Head free in the axilla. Axillary incision. Reduction of head and pegging of fragments. Primary union. Remote result, fair. *Souchon, loc. cit.* p. 328.

2. MCBURNEY (1895).—Man of 28. Fell from a chair in a "fit." Subcoracoid luxation. Operation by deltoid incision, 25 days later. Head replaced in glenoid cavity with McBurney's hook and vigorous external finger pressure. Good use of arm resulted. ANNALS OF SURGERY, 1896, xxiii, 501.

3. CURTIS (1899).—Girl of 11. Fall on shoulder and head. Head luxated into axilla. Operation the day after injury after futile attempts at reduction. Anterior incision at border of deltoid failed to expose the head. Kocher's posterior incision, with temporary resection of acromion was then made. By strong pressure of the fingers, through both wounds and in the axilla, the head was, with difficulty, forced into the glenoid cavity. A tendency of the shaft to ride upward was counteracted by the passage of a drill into the head, grazing the upper end of the lower fragment. Primary union. Good result. Abduction to 60° at time of report. ANNALS OF SURGERY, 1900, xxxi, 301.

II.—CLINICAL CASES NOT VERIFIED BY X-RAY, OPERATION OR AUTOPSY.

(9 in all)

1. V. LANGENBECK (1855).—Man of 22. Kicked by a horse. Subcoracoid luxation of the head. Efforts at reduction unsuccessful on two occasions. Good final result. Arm could be brought to horizontal. *Gurlt. loc. cit.* Obs., 175, p. 736.

2. DUNN, SMITH & ERICHSEN (1862).—Young man. Epileptic. Had a convulsion, and was saved from falling by his brother. It was the opinion that "the anatomical neck was broken across." Mr. Smith "forcibly seized the end of the depressed bone with both his hands, and lifting it up in the direction of the socket, found to his great satisfaction and surprise that the head of the bone slipped readily into the glenoid cavity." The result was a perfect cure. The context, however, would lead to the belief that this was simply a *dislocation without a fracture. British Med. Jour.*, 1862, i, 140.

3. DERMARQUAY (1866).—Woman of 38. Struck by a carriage on shoulder and fell on elbow. Subcoracoid luxation. Impossible to reduce under chloroform. *Oger, loc. cit.*, No. 40.

4. Fraser (1867).—Boy of 15. Caught by a crank of a balance wheel. Multiple injuries. Among them, a "downward dislocation of the humerus, and, upon rotating it after reduction, crepitation was very perceptible at the joint, showing a fracture at the anatomical neck." Final result: "The shoulder-joint, to all appearances, is as natural as before the accident." *Amer. Jour. Med. Sci.*, 1860, lvii, 372.

5. Gosselin (1869).—Caused by a fall. Head of bone luxated into axilla. Failure to reduce after union. *Oger, loc. cit.*, p. 55.

6. v. Mosengeil (1874).—Railroad employé. Head replaced by manipulation. Good result. *Arch. f. klin. Chir.* xvi, 524.

7. Bouilly (1884).—Man of 48. Fell from a tree. Both bones of forearm also broken. Reduced easily on the 8th day, without chloroform, by continuous extension with apparatus of Hennequin. Home in a month. Final result as to function unknown. *Oger, loc. cit.*, No. 16.

8. Bertini (1885).—Intracoracoid luxation. Easy reduction by pressure. *Poirier et Mauclaire, loc. cit., Obs.* 9.

9. Prewitt (1901).—Man of 27. Fell from a wagon in a runaway. Head easily replaced under chloroform. *Interstate Med. Jour.*, 1901, viii, 61.

III.—Specimens Without Clinical History.

(6 in all)

1. Cooper (1824).—Specimen clearly delineated on a plate. Head had formed a false joint on the scapula. It was united by a little tongue of bone to the body of the humerus. Humerus had formed a false joint at the glenoid cavity. *Guy's Hosp. Rep.*, 1839, iv, 275.

2. Huguier (1852).—"The head of the humerus had been separated from the bone and placed between the subscapular and serratus magnus. It adhered to the bone and was found bare in the hollow of the axilla. As there was no anchylosis, it is probable that the patient had use of her arm." *Oger, loc. cit.*, Obs. 4.

3. Dupuytren's Museum.—Specimen No. 729. Intracoracoid luxation. *Oger, loc. cit.*, p. 27.

4. St. Bartholomew's Hospital Museum.—Specimen No. 103, Subcoracoid dislocation. Fibrocartilaginous union. *Gurlt. loc. cit.*, Obs. 114, p. 704.

5. Museum College of Surgeons of Ireland.—Subglenoid dislocation. *Bennett in Brit. Med. Jour.*, 1881, i, 638.

6. Leo (1903).—Dissecting room specimen. Aged woman. Fracture of both anatomical and surgical neck. Subcoracoid luxation with nearthrosis. Free motion at shoulder on cadaver. *Bull. et Mem. Soc. Anatom. de Par.*, 1903, 6th Ser., v, 248.

MECHANISM OF THE INJURY.

The manner in which this peculiar injury is produced has engaged the attention of surgeons since the report of Houzelot's case by Delpech in 1808.

Delpech (quoted by Poirier and Mauclaire, *l. c.*) believed that the fracture of the anatomical neck occurs first; then enucleation of the head through the capsule by direct force.

Lallemand (1827) was of the opinion that the luxation occurs first; then the fracture *by muscular contraction against the coracoid process or the ribs.*

Sir Astley Cooper (1839) expressed himself thus: "This accident generally occurs in the following way: A person falls and pitches with violence on his shoulder, or a heavily laden carriage passes over it. By the first impression of the accident, the *os humeri* is dislocated; and, by a second, the neck of the bone is broken, and the head detached and lodged in the axilla." (Bennett has called attention to the fact that in none of the recorded cases was the injury produced by the passage of a carriage-wheel over the shoulder.)

Malgaigne (1855) said: "It is very difficult to define exactly the mechanism by which the two lesions, dislocation and fracture, are produced; to determine whether the two lesions are simultaneous; or which precedes the other; whether they are due to direct or indirect injury." However, in his chapter on subluxations of the humerus (in which he was a believer), he called attention to certain specimens of old unreduced dislocations which exhibited a groove or gutter, either on the upper aspect of the head itself or at the upper part of the anatomical neck; and he asked the question "whether sometimes these (grooves) are not produced at the same time as the luxation *by crushing of the head against the glenoid border.*"

Mr. Joseph Bell (Edinburgh Med. Journal, 1863) refers to a case of pertubercular fracture, with dislocation, in which the head and lesser tuberosity were separated from the rest of the bone, and he asks: "How is this fissure produced? Not by any peculiarity in the direct violence which caused the injury, not by any conceivable action of the muscles, but *by the sharp edge of the glenoid border being forced as a wedge against the posterior groove of the humerus.*"

Spence (1863), whose case was doubtful as to the line of

fracture, said: "As it is scarcely conceivable that both injuries could have occurred at the same time, it is probable that she dislocated her shoulder by the fall, and subsequently fractured her humerus while rolling down the stair."

Bennett (1880) expressed the following opinion: "Fracture of the upper extremity of the humerus, occurring as a complication of dislocation, commences at that part of the anatomical neck which rests, after dislocation has taken place, against the border of the glenoid cavity. It is caused by *pressure of the humerus against the sharp edge of the glenoid cavity,* probably resulting from a constrained position preventing the separation of the elbow from the side, as in ordinary dislocations."

The suggestion by Malgaigne that the indentations on the head or on the anatomical neck of his specimens of old unreduced dislocations might have been produced by the primary violence forcing together the sharp edge of the glenoid and the head or neck of the humerus, and the unqualified opinion of Mr. Joseph Bell that his pertubercular fracture-dislocation was produced in this way, received an interesting confirmation by some later specimens of recent dislocations.

Mr. Eve (Med. Chir. Trans., 1886, LXIII, 317, quoted by Caird in Edinburgh Med. Jour. 1887, XXXII, Pt. 2, 711) reported the case of a man of 36 years, who was knocked down by a train and sustained a subcoracoid dislocation, in addition to other injuries, from which he died in 12 hours. Reduction was easily effected before death. At the autopsy there was found "a deep vertical indentation or groove at the posterior margin of the articular surface of the head of the humerus, into which the anterior margin of the glenoid cavity accurately fits. It appears to have been produced by the violent impact of the head against the prominent rim on which it probably lodged."

Dr. Francis M. Caird (*loc. cit.*, p. 710) describes two recent specimens without history, which are in the Museum of the University of Edinburgh. Both exhibit almost precisely the same kind of indentation along the anatomical neck

as is described by Eve. Dr. Caird's illustration of one of his specimens is reproduced in Fig. 3.

Broca and Hartmann (Bull. de la Soc. Anat., 1890, No. 14, quoted by Stimson), also report a similar specimen in which "the indentation lay wholly or in part along the junction of the head and shaft, above and behind the greater tuberosity, was from one to one and one-half inches long and from one-quarter to one-half an inch deep and accurately fitted the inner lip of the glenoid fossa."

Stimson, in his excellent work on "Fractures and Dislocations" (1905) says, "Fracture of the anatomical neck (with dislocation) is difficult of explanation. The probable cause, in my opinion is the wedge-like action of the inner edge of the glenoid fossa against the anatomical neck."

Salmon (Med. Council, 1900, V, 134) writes as follows: "Fracture of the anatomical neck of the humerus usually occurs in conjunction with dislocation. It may occur after the head of the bone has left the glenoid cavity, the sharp antero-inferior margin of the cavity acting as a wedge. The mechanical production of this fracture is illustrated by a lever of the first class, the power being represented by the weight of the arm and any force applied below the insertion of the deltoid. The fulcrum is the attachment of the deltoid, and the weight is the resistance encountered at the antero-inferior margin of the glenoid cavity."

ANALYSIS OF THE CAUSES OF THE INJURY, IN THE CASES HERE RECORDED, AS BEARING ON THE MECHANISM.

Of the 29 undoubted cases with clinical history, the cause of the injury is stated in 22. *In these 22 cases, without a single exception, the cause of the injury was a fall.*

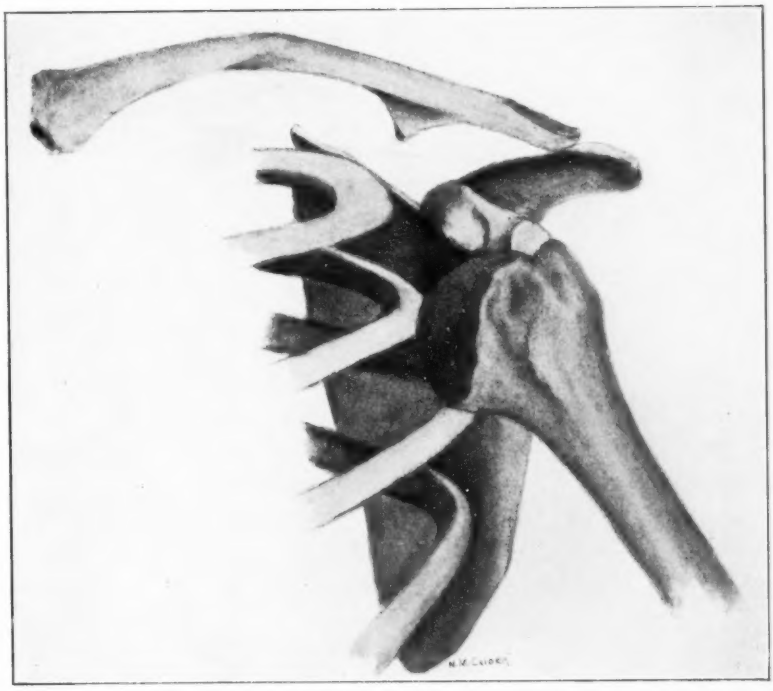
Fall to the ground, by tripping, 6 cases: (Travers, Poirier, Poirier and Mauclaire, Keen, Curtis, Buchanan).

Fall from apoplexy, convulsions or heat strokes, 4 cases: (Houzelot, Lenoir, Curtis, McBurney).

Fall by being struck by carriage, 1 case: (Jepson).

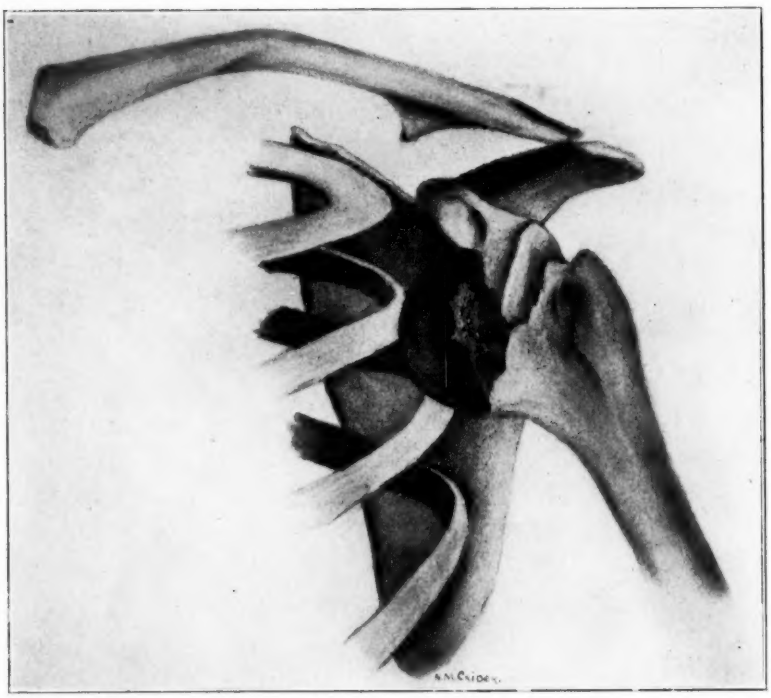
Fall from a horse, 3 cases: (Cooper, St. Thomas' Museum, Mabboux).

FIG. 4.



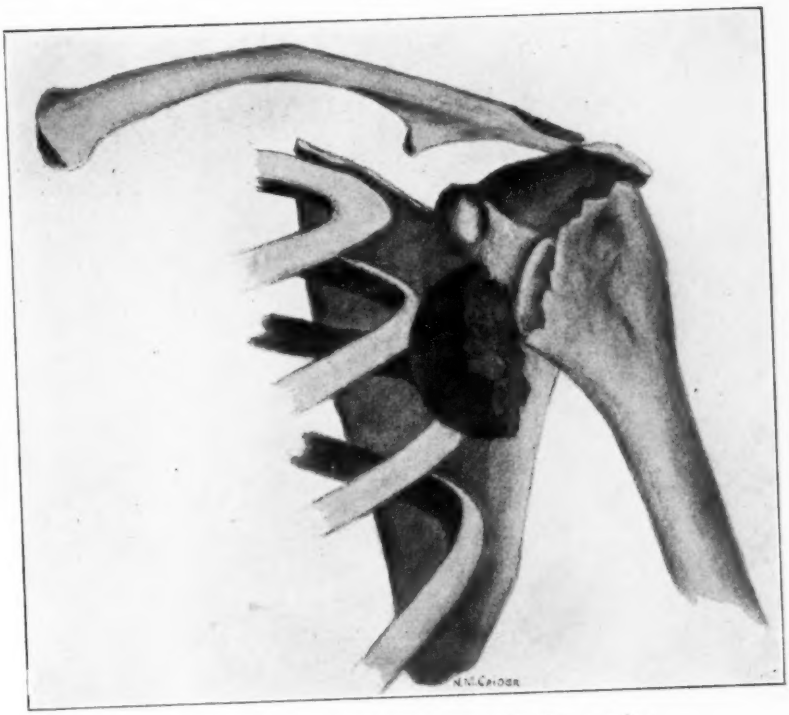
Showing upper part of anatomical neck pressed against anterior margin of the glenoid process.

FIG. 5.



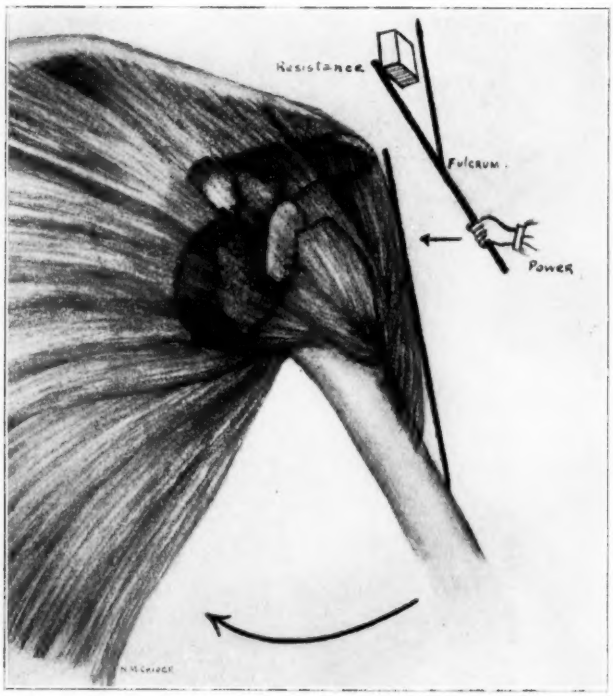
Showing head of humerus being separated by line of fracture through the anatomical neck by wedge-like action of margin of glenoid process.

FIG. 6.



Head complete split off by force illustrated in Figs. 4 and 5.

FIG. 7.



Muscular leverage exercised to separate shaft of humerus from fractured head.

Fall from a vehicle, 2 cases: (Gerster, Brigham).

Fall down stairs, 3 cases: (Key, Morton, Salmon).

Fall from a height, 3 cases: (Lallemand, Surg. Manch. R. I., Croft).

CONCLUSIONS AS TO THE MECHANISM INVOLVED.

Those specimens of dislocation of the humerus, with indentations of the anatomical neck, described by Eve, Caird (Fig. 3), and Broca and Hartmann show clearly that, in certain cases, after dislocation has occurred in the usual manner, by hyperabduction of the limb, and the head is resting under the coracoid, with the upper part of the anatomical neck against the lower and anterior sharp margin of the glenoid process (Fig. 4), a new application of force occurs, which is transmitted through the shaft of the bone and pushes the anatomical neck with sufficient force against the glenoid edge to make the indentation.

If we now suppose that this force is greater, or the neck, by reason of the atrophy of age, is less resistant, we have a partial separation of the head from the shaft by the wedge-like action of the glenoid as shown in Fig. 5. It is perfectly conceivable that, in many cases, this force should continue to act till the head is completely split from the shaft in the line of the anatomical neck (Fig. 6). On the other hand, it seems more probable that, as the body pitches forward in falling, the arm, which at first is abducted and then pushed upward in the axis of the humerus, should be forced against the body in adduction.

The inevitable result of this adduction of the elbow would be to cause a strong leverage as shown in Fig. 7, in which the long arm is the humerus from the insertion of the deltoid down to the point of application of the force; the short arm is that portion of the bone from the deltoid attachment to the anatomical neck; and the fulcrum is the insertion of the deltoid muscle.

It is therefore probable that a fall on the outstretched arm or hand may cause (1) a dislocation; that, if the body pitches

forward with the hand or arm still on the ground, the force is applied in a new direction—along the line of the shaft—and (2) an indentation of the neck occurs or (3) a partial or complete separation of the head; that, if the body is projected further forward, the force is applied in still another direction—compressing the elbow to the side—and (4) the partial cleavage of the neck is completed by a strong leverage of the arm.

In a very large proportion of the cases, repeated efforts at reduction were made before the double injury was discovered and these will account for the different locations of the head and the different degrees of its impaction in the soft tissues.

TREATMENT.

1. *Restoration of the dislocated head to the glenoid cavity by external manipulation.*

There is no recorded case of anatomical neck fracture-dislocation, in which reduction has been accomplished by external means and the line of fracture verified by the X-ray or by autopsy. At the same time, the unverified cases of Fraser, v. Mosengeil, Bouilly, Bertini, and Prewitt, in which the replacement was accomplished, certainly make it incumbent on the surgeon to make an effort at reduction if the head of the bone can be shifted without undue violence.

2. *Restoration of the dislocated head by open incision.*

This has been done in but three cases of true anatomical neck fractures, with one good result, one fair result, and one result which could be counted fair at the end of seven weeks, the time of report. The operation is difficult, and requires much manipulation. In one case, both anterior and posterior incisions were made, and a temporary resection of the acromion. In two cases, the fragments required fixation with drill and peg. The risks of such a severe traumatism, the creation of a compound fracture in immediate proximity to a large opened joint, and the frequent necessity of fixing the fragments by peg or drill would hardly seem to be compensated by the results so far obtained. In a case, however, where reduction could be accomplished without much manipulation

and the fragments approximated satisfactorily, it is probable that no surgeon would hesitate to try to restore the integrity of the joint.

As an aid to the replacement of the fragment, use may be made of the bodkin invented by Simon Duplay to *push* the head into place. It is described by Poirier and Mauclaire (1892) as a steel rod, 6 to 8 centimetres long and 3 to 4 millimetres in diameter, held by a thick, short handle, and terminated by an abruptly conical point. Or the well-known hook of McBurney (1894) may be used to *pull* the head into place.

3. *Excision of the dislocated head.*

This seems to be the operation of choice, having been performed in 14 cases, with 2 results called excellent; 6, good; 1, moderately good; and 2 deaths to its discredit.

One of these deaths (Morton's), in the first case operated on, seemed to have no connection with the operation or injury. On the face of the reports as to functional results, excision of the head would seem to be preferable to replacement. The number of cases, however, is yet too small on which to base a decided opinion.

THE TREATMENT OF DISLOCATION OF THE SHOULDER-JOINT COMPLICATED BY FRACTURE OF THE UPPER EXTREMITY OF THE HUMERUS,

WITH AN ANALYSIS OF SIXTY-THREE CASES WITH FRACTURE AT THE NECK OF THE HUMERUS AND TWENTY-ONE CASES WITH FRACTURE OF THE GREATER TUBEROSITY REPORTED SINCE 1894.*

BY J. M. MASON, M.D.,

OF BIRMINGHAM, ALA.

My attention has been particularly directed to the above class of injuries by a case of double dislocation of the shoulders with fracture of the surgical neck of the right humerus, which came under my care in November, 1906. The history of the case is as follows:

K. S., white male, aged 35, was knocked from an ice wagon by a street car and sustained injuries to both shoulders and severe contusions of the left leg. The accident happened about 9 A.M. Nov. 11, 1906, and I saw him at St. Vincent's Hospital about an hour later.

It was evident from the deformity that he had sustained dislocations of both shoulders. He was anæsthetized for further examination and for reduction of the dislocations. The left shoulder was treated first, and was easily reduced by the Kocher method. On examining the right shoulder crepitus was at once elicited, and it was found that there was a fracture very high up, as well as a dislocation. Both dislocations were of the subcoracoid variety.

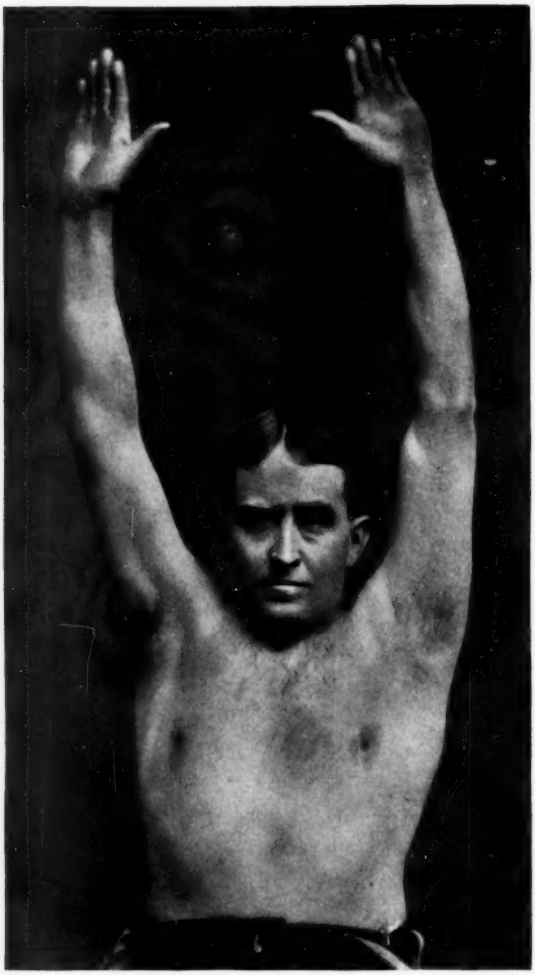
Attempts were made to reduce the dislocations but they were unsuccessful. The patient was allowed to recover from the influence of the anæsthetic, the nature of the injury was explained to him and his permission was secured to perform arthrotomy for reduction of the dislocation if we found that this should be

* Read at the annual meeting of the Southern Surgical and Gynecological Association, New Orleans, Dec. 18, 1907.

FIG. 1.

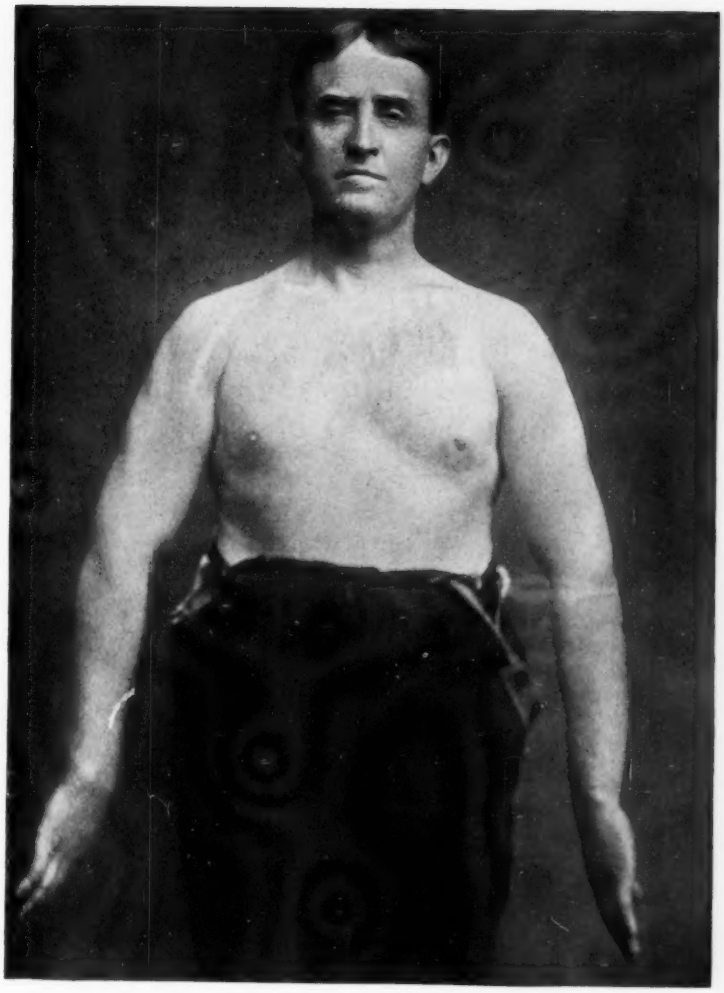
Dislocation of shoulder complicated by fracture of surgical neck of humerus. Seven weeks after operation.

FIG. 2.



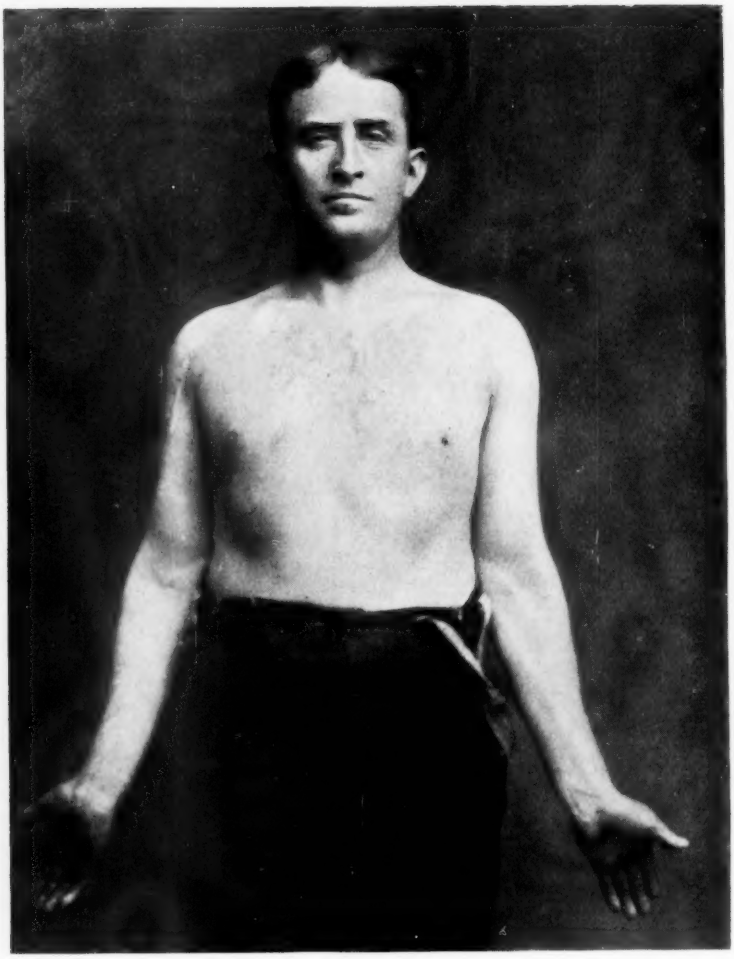
Dislocation of both shoulders, with fracture of surgical neck of right humerus. Thirteen months after operation.

FIG. 3.



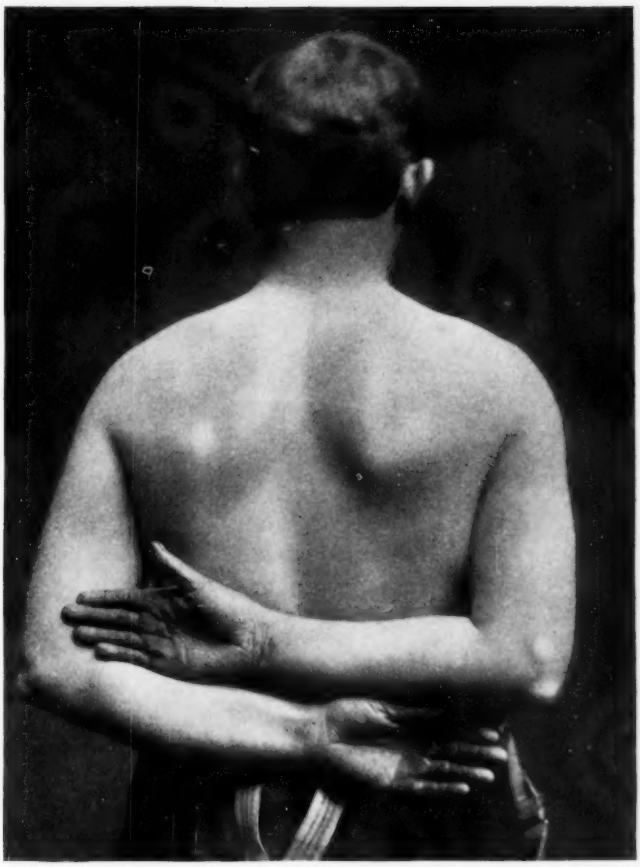
Dislocation of both shoulders with fracture of surgical neck of right humerus. Thirteen months after operation.

FIG. 4.



Dislocation of both shoulders with fracture of surgical neck of right humerus. Thirteen months after operation.

FIG. 5.



Dislocation of both shoulders, with fracture of surgical neck of right humerus. Thirteen months after operation.

necessary. After consultation, he was again anæsthetized, six hours after the injury, and further unsuccessful attempts were made to reduce. These consisted principally in making gentle traction and abduction, together with direct pressure on the head. The joint was then exposed by the anterior incision. The head was found displaced under the coracoid, and a transverse fracture of the humerus was found at the surgical neck with a long splinter torn from the shaft and attached to the upper fragment. The capsule was torn on its anterior aspect. The upper fragment was grasped with lion-jawed forceps but no change in its position could be made. A periosteal elevator was then used and the head was pried into position with but little difficulty.

Before effecting reduction the coracohumeral ligament had to be divided for a few centimetres.

A hole was drilled through the centre of the lower fragment of the humerus, near the line of fracture and a silver wire was passed through this and tied on the outer side of the bone, thereby binding the splintered portion of the fracture to the shaft. There was very little tendency to displacement of the fracture in an inward direction on account of the presence of a periosteal band which connected the two fragments.

The divided coracohumeral ligament and the rent in the capsule were closed with catgut, and a small gauze drain was carried down to the point of fracture. This drain did not communicate with the joint cavity, as this had been completely closed. The drain was removed in a few days and the wound healed by first intention. For four weeks the arm was kept on an internal angular splint with a shoulder cap.

At the time of the injury, the X-ray machine at the hospital was not in working order, so no pictures were obtained before the operation. A picture taken seven weeks after operation shows a good anatomical result, and the functional result is perfect. There is no restriction of movement in any direction. There is neither atrophy, pain, nor weakness in the arm. The accompanying photographs taken Dec. 1, 1907, give an opportunity of comparing in this patient the results of arthrotomy and reduction of the fracture-dislocation on the right side, with that obtained in reduction by the Kocher method of a simple uncomplicated dislocation on the left side. The movements in each shoulder are as free as they were before the injury, and he has been doing for

the past eight months exactly the same work in which he was engaged when he was injured,—delivering ice from a wholesale wagon, and handling 100 pound ice blocks daily.

The presentation of this subject in most of our surgical text-books is not made, upon the whole, in a manner befitting its gravity and importance. There are, however, notable exceptions. Before the appearance in 1894 of McBurney's paper describing the use of his hook, very little had been accomplished in the way of successful treatment of these injuries. Too great stress was laid upon efforts to reduce by manipulation, and McBurney cites 6 cases where death resulted from the violent and persistent efforts which were resorted to in attempting to bring about reduction.

Numerous cases are recorded where fracture of the neck of the humerus has occurred in attempting reduction of difficult shoulder dislocations.

The older methods of treating fracture-dislocation of the shoulder consisted of:

1. Reduction by manipulation. This should still be practiced with gentleness.

2. Securing union in the fracture and then attempting to reduce the dislocation by manipulation, using the re-united shaft of the humerus as a lever. Oger, cited by McBurney, collected all cases treated in this manner up to 1894, 10 in number, with 7 absolute failures and 3 doubtful successes.[59] In the series of cases herewith presented, one case was so treated, and refracture of the humerus occurred. The method has nothing to commend it, and should be mentioned only to be condemned.

3. The Riberi method. This consisted in making early passive motion with the object of making a false joint at the point of fracture and leaving the dislocation untreated. This method is unworthy of consideration at the present time.

4. Resection. At one time this was offered as an operation of election, and is still in many cases, especially those of long standing, the best thing possible. However, as an opera-

tive procedure, it should be made use of only when reposition cannot be accomplished.

At the present time it is conceded that the best way in which to proceed is to first secure reduction of the dislocation, and then to direct attention to treatment of the fracture.

ARTHROTOMY.

Failing in reasonable attempts to secure reduction of the dislocation by manipulation, sufficient evidence is now at hand to justify us in claiming that immediate arthrotomy with reduction of the dislocation, with or without the use of hooks, followed by suture or reduction and immobilization of fracture, is the ideal method of dealing with this class of cases.

In 1859 Gross wrote, "I should not hesitate if a case of the kind should present itself to me, to cut down upon the dislocated bone and push it back into its normal position." [64]

Stemen, in 1870, first put this plan into successful operation. In one of our very latest systems of surgery, however, we note "an anæsthetic should always be administered and every method should be tried in order to reduce the head before an operation is attempted." [60] This, to say the least, certainly puts operation on the defensive.

Scudder advises operation in case manipulation fails, and says, "if operative interference has been decided upon it is best to defer operation until acute symptoms have subsided and the damaged tissues have recovered themselves." [61] To this I do not entirely subscribe, for if this teaching is followed, it will eliminate immediate operation, which, from reported cases, has given the best results. He advises McBurney's operation, with use of his hook.

Stimson advocates gentle traction with direct pressure on the head before adopting other measures, and next advises McBurney's operation.[62] Concerning time he says "I do not condemn the early operation or primary excision when indicated, but I here warn against the tardy early operation, cutting into swollen discolored tissues about severe injuries after the second day." [63]

Schoch states that arthrotomy is favored by Vamossy, Nicoladoni, Keuster, Albert, Socin, Trendelenburg, Rose, Schoenborn, Nélaton, von Bergmann, and other European surgeons.[34] A large number of the highest surgical authorities in this country also favor it.

In a review of fractures and dislocations in the December (1907) *Progressive Medicine,* Bloodgood says, "when fracture is associated with dislocation of a fragment including a portion of the head, open incision should be employed if perfect reduction cannot be made." Quoting Schlange on irreducible fractures and dislocations he says, "as to dislocations there can be no question—every irreducible dislocation should be subjected to immediate open incision and reduction. The time to operate is at once. The changes that will take place in the joint and its surroundings by delay may be irreparable. There should be no old dislocations." [65]

This subject should be presented to every surgeon and to every general practitioner in such a light that he may realize the value of time in the prognosis of his cases. Many of these cases come first into the hands of the general practitioner, and the history of nearly all the cases classed as "old" is that they received some sort of palliative treatment, or the real nature of the injury was undiscovered until a varying time had elapsed. Every practitioner should realize the gravity of any sort of fracture-dislocation or irreducible dislocation of the shoulder, for upon him rests the responsibility of placing his patient in competent surgical hands at once.

While Stemen successfully performed arthrotomy with reduction of dislocation and fracture in 1870, he did not report his cases until 1893, and then they did not seem to attract much attention, so we must consider the invention and use of the McBurney hook as the real beginning of operative reductions. In his collection of cases up to 1894, 117 in number, he says, "at least 6 cases of open operation can be referred to, in every one of which the head was either primarily or secondarily removed." [58] Stemen's cases are not included in his collection.

He considered "arthrotomy a grave operation, which, while it has resulted well in a few cases and has the endorsement of high surgical authority, can possibly never give a perfect functional result." [58]

It was claimed that the use of the hook was superior to open arthrotomy in that the hook could be used with less dissection and disturbance of the tissues, and that it might, in some cases, be used without entering the joint at all. Recorded experiences with the hook do not seem to establish for it any superiority over open arthrotomy. The dislocated head has been reduced many more times by the use of elevators, fingers, and forceps than has it been by the use of the hook; and there are numerous cases of perfect results after open arthrotomy. Of the 23 cases of arthrotomy and reduction in my series, secondary excision was practiced in only one instance.

So far as I have been able to find, the hook has been used 12 times, and has failed to reduce the dislocation in 6 instances.

The reported cases are as follows:

Operator	No. Cases	Successful	Failure
Bull	1		1
Brown	1		1
Curtis	1		1
Dandridge	1	1	
Morton	1	1	
Porter	2	1	1
Berger	1		1
Wyeth	1		1
McBurney	3	3	
Total	12	6	6

These cases, with the exception of McBurney's first case, are recorded in my tables. Dandridge's case had recurred at the end of a month, and he says of it, "either the dislocation had recurred or it had not been reduced." [7]

Upon this showing, I do not believe the use of the hook is entitled to the prominence that is given it in the text-books.

McBurney collected from the literature up to 1894, 117 cases of dislocation of the shoulder with fracture at the neck of the humerus. To bring the statistics up to the present time,

TABLE No. I.—RECENT DISLOCATION WITH FRACTURE AT SURGICAL NECK.

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation: Success	Failure	Fracture	Suppuration	Primary union	Result	Result classed as
Bull, W. T.....1 1897.	1	4-12-96	M.	15	S. G.	Arthrotomy. Hook tried but failed. Head pried into place with periosteal elevator. This case was one of epiphyseal separation. Immobilized.	48 hrs.	Yes	Failed	2 gauze drains into joint		1		1		Moderate stiffness. Rotation half normal. Abduction ¾ horizontal. Movements of scapula complete a range of motion but a trifle short of that possible on the sound side. 8 mos.	Fair.
Brown, Geo. S...2 1897.	2		M	50	S. C.	Arthrotomy. Head wrenched back into place. Fragments came together so well it was not necessary to wire. Hook was used but pulled out.	48 hrs.	Yes	Failed	Silk worm gut strands					1	2 mo. As good condition, apparently, as before injury.	Good.
Lyman, C. B....4 1900.	3	6-7-97	M	42	S. C.	Arthrotomy. Slight pull with forceps on lower end of upper fragment, at right angles to body, caused reduction. Wired fracture.	7 days			?		1				Complete recovery with good use of arm.	Good.
	4		M	35	?	Traction with forceps as above together with slight rotation and extension, caused reduction. Wired fracture.	Immediate	No		?		1	1			Complete recovery with good use of arm. Results in both cases as good as seen in simple uncomplicated dislocations.	Good.

Curtis, B. F.....6 1900.	5	12-4-95	M	14	S. C.	Arthrotomy. Hook. Bone too soft and hook pulled out. Head replaced by fingers and blunt instruments. Head was in inward rotation, so shaft was rotated inward and wired. 1 inch resected from lower fragment.	4 weeks	Yes	Failed						1	3 mos. Raises arm 45° without moving scapula. Constantly gaining. Inward rotation greater than normal. Outward rotation is limited. Later improving.	Good.
Dandridge, N. P. 7 1900.	6	10-11-07	M	?	S. C.	Arthrotomy. Hook applied. Slipped out. Again used and complete reduction seemed to have occurred. Immobilized.	18 days	Yes	Success	Tube		1		1	1	1 mo. X-ray shows no change in position of head. Either dislocation had recurred or had not been reduced. Ankylosis.	Bad.
Morton, T. S. K. 8 1896.	7		M	74	?	Arthrotomy. Hook used. Pulled out. Again used. Raised head to edge of glenoid. Again pulled out. Finger pressure completed reduction. Wired fracture.	Immediate	Yes	Success	Tube		1	1			Sat up 8th day. Died suddenly. Wound clean.	Died.
Williams, H. J...9 1896.	8	12-95	M	48	?	Chloroform. Reduction of dislocation and adjustment of fracture. 5 weeks. Ankylosis. Violent manipulation and vigorous passive motion for 7 weeks.	Immediate				1(?)				12	12 weeks. Abduction 45°. Forward and backward motion is nearly entirely recovered.	Bad.
Monks, G. H. ..21 1896.	9		M	50	S. G.	Arthrotomy. Could not replace head on account of subscapularis tendon. This was cut. Head excised.	Immediate					1				Death on 4th day. Wound clean.	Died.

TABLE No. I.—RECENT DISLOCATION WITH FRACTURE AT SURGICAL NECK.—*Continued.*

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation: Success	Failure	Fracture	Suppuration	Primary union	Result	Result classed as
Rovalet, A.....26 1901.	10	11-18-00	M	46	S. C.	Bandage. Massage 15 days, then movements. New articulation formed.	2 days					1				2½ mos. Elevation to horizontal. Vertical elevation impossible. Adduction is good. Abduction easy to horizontal; extension and flexion good. 1 year improved.	Fair.
	11		M	39	?	Rest and massage.	8 days					1				2½ mos. Improved considerably.	Improved.
Von Eiselberg..32 1902.	12				?	Arthrotomy. Reduction. Wired fracture.	Immediate									The best result.	Good.
Koehler, Wm...33 1901.	13	4-2-01	F	50	S. C.	Anæsthesia. Extension with 10 pound weight. Counter extension upward.	Immediate									7½ mos. Movements considerably restricted. Elevation 110°. Ext. rotation almost lost. Int. rotation good; pain in elbow on moving arm.	Fair.
Schoch, Egon..34 1900.	14	11-20-97	M	39	S. C.	Rest 14 days. Unsuccessful effort at reduction. Arthrotomy. Fracture already united. Reduction by elevation and external rotation.	16 days			Yes		1				7 mos. Shoulder functions perfectly normal.	Good.

Rouette.....35 1903.	15	10-23-02	M	29	S. C.	Resection.	20 days			Yes		1		1	Can raise arm to horizontal and carry hand to head.	Improved.
Royster, H. A..39 1907.	16	11-25-05	M	60	S. C.	Arthrotomy. Head replaced without slightest difficulty. No wiring necessary.	4 hours			None				1	Perfect. Has as good use of shoulder as he ever had.	Good.
Berger.....41 1898.	17	6-22-98	M	32	Backward	Reduced under chloroform.	3 days				1				2 mos. Mobility satisfactory. Œdema to elbow. Marked atrophy of deltoid.	Improved.
Stemen, C. B...45 1893.	18	1870	M	30	?	Arthrotomy. Reduction by grasping bone with lion-jawed forceps. Treated as a compound fracture.	10 hrs.	No		Yes		1			Good.	Good.
	19	?	?	?	?	Similar case similarly treated, only in this case which was a few years ago, we used antiseptic precaution and wound healed by first intention.	Recent							1	Good.	Good.
Porter, C. B....42 1894	20	11-18-93	M	54	S. C.	Arthrotomy. Reduction with hook. Loose fragments of bone removed.	9 days	Yes	Success			1			6 mos. As good as before operation.	Good.
1897.....43	21	1896	F	50	?	Arthrotomy. Hook unsuccessful. Biceps tendon divided and the head finally replaced. Wired bone. Prolonged suppuration finally required resection.	1 mo.	Yes	Failed			1	1	1	1 year. Fistulous tracts persist. Can reach head with hand.	Improved.
Brinton, J. H...49 1897.	22		F	?	Backward	Excision.	3 days			Yes		1		1	2 mos. Motions of false joint returning satisfactorily.	Improved.

TABLE No. I.—RECENT DISLOCATION WITH FRACTURE AT SURGICAL NECK.—*Continued.*

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Suppuration	Primary union	Result	Result classed as
											Success	Failure	Fracture				
Berger .....40 1896.	23		?	?	S. C.	Arthrotomy. Hooks and levers failed. Replaced by seizing tuberosities with forceps and applying force. Immobilized fracture.	10 days	Yes	Failed	Yes		1				3 mos. Carries hand to head. Can raise elbow to level of shoulder.	Improved.
Lane, Arbuthnot 51 1903.	24		M	60	S. C.	Wired fracture. Does not mention treatment of dislocation.	Probably Recent									"Uneventful progress."	Not stated.
Wohlgemuth, 19 Heinz 1900.	25		M	40	S. C.	X-ray. Surgical neck, greater tuberosity and whole crista tuberculi majoris fractured. Anæsthetized. Dislocation reduced. Fracture immobilized.	Recent				1					Greater tuberosity has united further posteriorly on shaft. Ext. rotation almost entirely prevented. Elevation markedly impaired. Abduction 60°.	Improved
Clutton, H. H..53 1894.	26	3-30-94	M	13	S. C.	Shock caused delay 11 days. Arthrotomy. Head replaced by direct pressure and traction. Drill passed vertically downward from head into lower fragment. Ivory peg inserted. Biceps tendon had to be cut and was sutured.	11 days	No				1				8 mos. All movements of shoulder-joint are performed perfectly. Keloid in scar.	Good.

Wyeth, J. A.... 1895.	55	27	10-22-95	F	45	?	Arthrotomy. Hook inserted in 3 different places. Failed to reduce. Adhesions made reduction impossible. Excision.	2 weeks (?)	Yes	Failed		1				Death in 21 hours. From history of another injury subsequently obtained, and appearance of parts at operation, he believes dislocation occurred 1 year before, fracture 2 weeks before.	Died.
Mason, J. M..... 1907.	28	11-11-06	M	35	S. C.	Efforts to reduce failed. Arthrotomy. Head pried into its place with periosteal elevator. Fracture wired.	6 hours	No		Gauze to point of fracture not into joint.		1		1	1 year. Perfect result. No limitation of motion in any direction. No atrophy. No pain. No loss of strength.	Good.

TABLE No. II.—OLD DISLOCATION WITH FRACTURE AT SURGICAL NECK.

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation: Success	Failure	Fracture	Suppuration	Primary union	Result	Result classed as
Lyman, C. B....4 1900.	1		F	42	S. C.	Head displaced for one year and fibrous union of fracture had occurred. Resected and wired fracture. Intended to treat dislocation later. Patient did not return.	1 year					1				3 years. Solid union of fracture. Quite free motion in new position beneath the coracoid.	Fair.
Porter, C. B....20 1903.	2	10-11-02	M	?	S. C.	Arthrotomy. Removal of head.	1 mo.					1			1	1 mo. Great improvement. Lifts right arm to horizontal. Fast gaining use of left.	Improved.
	3	10-18-02	M	?	S. C.	Arthrotomy. Removal of head.	6 weeks					1			1	A case of double fracture-dislocation.	Improved.
Dollinger, J....31 1902.	4		?	?	?	Resected head and upper fragment which had united at right angles.	Old					1				No notes.	No notes.
Abrazhanoff, A. A. 1896. 36	5	10-14-95	M	62	S. C.	Unsuccessful attempts to reduce by manipulation under ether. Resected head.	7 weeks					1				3½ mos. Raises arm 45°. Abduction and adduction free. Circumduction limited. No pain. Can lift heavy weights.	Improved.

Royster, H. A..39 1907.	6		F	52	?	Physician failed in efforts to reduce. Decided to wait for union, then to attempt reduction. Royster, in attempting reduction by Kocher's method refractured. Arthrotomy. Could not replace head. Tried to produce false joint, but fracture reunited.	9 weeks				1	1		Effect of operation was nil.	Bad.
Linon.....51 1898.	7		M	45	S. G.	X-ray. Head united to outer portion of humerus. Surgical interference not considered. Massage and electricity to try to improve extensive paralysis.	60 days				1			3 mos. Deltoid greatly improved. Raises arm to horizontal. Can close hand ½.	Bad.
Ricketts, B. M..54 1894.	8	4-94	M	49	S. C.	Failure to reduce under anæsthesia. Rest 6 weeks. Arthrotomy. Anatomical and surgical necks broken and ununited. Nothing further attempted. Wound closed.	6 weeks				1			No notes on functional result. The general health is improved. Asks "Should head have been resected at time of attempted arthrotomy?"	Bad.
Royster, H. A..39 1907.	9	7-19-05	?	45	S. C.	Comminuted fracture upper extremity of humerus. 6 separate fragments. Line of fracture through surgical neck and 4 inches down shaft. Removed loose bone and packed cavity to form false joint.	6½ weeks			Yes				2 years. Can use arm for all ordinary purposes and with assistance of the other hand can put it in any position except wide adduction.	Improved.

TABLE No. III.—RECENT DISLOCATION WITH FRACTURE AT ANATOMICAL NECK.

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation: Success	Failure	Fracture	Suppuration	Primary union	Result	Result classed as
Curtis, B. F.....6 1900.	1	3-28-99	M	29	S. C.	Arthrotomy. Head entirely outside capsule. Feared necrosis if replaced and newly formed vascular connections disturbed. Head and large part greater tuberosity removed.	21 days								1	6 mos. Abduction ½ normal. Int. rotation nearly normal. Ext. rotation much limited. Does heavy work and arm is gaining strength. Some atrophy.	Fair.
	2	9-6-99	F	11	S. G.	Arthrotomy. Anterior incision. Head could not be reached. Kocher's posterior incision. Acromion divided. Extension with pressure on head in front and behind caused reduction. Bone drill driven deep into head through anterior aspect of shoulder. Left in place 20 days. Acromion wired.	24 hrs.	No		None		1		1		50th day. Abduction 60°, adduction complete. Int. rotation almost normal. Ext. rotation much limited. Anteroposterior movements free. No atrophy. This arm was crooked and partially paralyzed from birth.	Fair.
Gerster, A. G. ..9 1898.	3	10-15-97	M	47	S. G.	Removal of head.	4 weeks			Tubes				1		Death on 5th day. Reacted poorly from operation and the wound suppurated.	Died.

McBurney, Chas. 10 1896.	4	11-10-95	M	28	S. C.	Arthrotomy. Hook. After 3rd pull, head was replaced with assistance of pressure on head. Surfaces met accurately. Sutured with cat gut.	1 mo.	Yes	Successful	Tube 4 days		1	1*	1	6 weeks. Good movement in all positions. Strength has returned fully except when arm is at right angles or higher.	Good.
Taylor, William 14 1901.	5		M	60	S. C.	Head displaced downward and inward. Also rotated. Fracture through anatomical neck. Also through great tuberosity and 2 small pieces near lesser tuberosity. Excision.	2 days								Lower motions of arm perfect. Limitation in upward motions. Has returned to work.	Fair.
Jepson, W. . . . .16 1900.	6	9-30-99	M	48	S. C.	Head of bone removed.	Immediate (?)					1			Motion of shoulder is good and function of arm seemingly not materially disturbed.	Fair.
Prewett, F. E. . .17 1901.	7		M	27	?	Head replaced. Fractured surfaces placed in apposition. Three days later dressing changed as it did not retain fragments in position. Again reduced dislocation and fracture.	24 hrs.				1				Perfect result.	Good.
Roualet, Adrien 26 1901.	8		F	23	S. C.	Unsuccessful attempt at reduction on 2nd, 9th, and 20th days. Further treatment by rest and massage.	9 days					1			6 weeks. Had recovered motion of elevation and adduction. Very limited.	Bad.
Clutton, H. H. .47 1892.	9		F	61	S. G.	Excision of head and great tuberosity.	8 days					1			8 mos. Can put hand to mouth, back of head, opposite shoulder, behind back. Shoulder rather fixed in raising arm from side.	Improved.

*Refracture.

TABLE No. III.—RECENT DISLOCATION WITH FRACTURE AT ANATOMICAL NECK.—*Continued.*

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment.	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation: Success	Failure	Fracture	Suppuration	Primary union	Result.	Result classed as
McGraw, Th. ..48 1897.	10		M	45	S. G.	Fracture through anatomical neck and completely detached in axilla. Second fracture passing from above and in front, downward, backward, and outward below tuberosities. Excised.	4 weeks					1			1	13 mos. Can lift arm nearly at right angles with body.	Improved.
Delorme .....24 1899.	11		?	?	?	Freed head and replaced.	28 days								Movements nearly all established.	Fair.
Dunham, M. V. B. 1895 56	12	1887	M	65	?	Rest and fixation for 7 weeks. Passive motion.	12 hrs.					1			Several months. Does light work not requiring an extensive range of motion. Places hand on head. Feeds and dresses himself.	Improved.
Reidel .....38 1900.	13	11-23-99	M	60	S. C.	Reposition effected by 2 pulls on adducted arm. Exact line of fracture not stated.	Few days				1				No notes.	No notes.

TABLE No. IV.—OLD DISLOCATION WITH FRACTURE AT ANATOMICAL NECK.

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Suppuration	Primary union	Result	Result classed as
											Success	Failure	Fracture				
Brigham, C. B. . . 3 1900.	1	12-12-99	M	34	S. G.	Excision of head.	5 mos.			Tube		1	1		1	Immediate cessation of pain. 1 month. Motion very much better than before.	Improved.
Pilcher, L. S. . . . 5 1901.	2	1900	?	?	S. C.	Fracture already consolidated, but head was rotated and displaced. Excised head.	6 weeks									3 mos. and 3 weeks. A steady improvement. Can do anything except the movements requiring use of trapezius.	Fair.
Keen, W. W. . . 67 1907.	3	12-27-05	M	60	S. C.	Arthrotomy. Upper end of humerus was almost entirely smooth. Hopeless to obtain union. Head completely rotated. Removed.	5½ weeks			Yes	1* (?)				1	13 mos. Raised arm ¾ normal. Atrophy is disappearing. Uses arm well in digging, etc.	Improved.
Maxwell, J. P. . 15 1902.	4		M	29	S. C.	Chloroform on 2 occasions. Failure to reduce. Excision of head.	5½ weeks			Yes		1			1	1 year. Rotation fair. Elevation almost vertical. Passes the hand behind back.	Fair.
Robert . . . . . 23 1899.	5	7-18-99	M	?	S. G.	Head disengaged from fibrous tissue adhesions, etc. Replaced by Farabeuf's forceps. Fracture already united.	55 days					1				No notes.	No notes.

TABLE No. IV.—OLD DISLOCATION WITH FRACTURE AT ANATOMICAL NECK—*Continued.*

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation: Success	Failure	Fracture	Suppuration	Primary union	Result	Result classed as
Tansini, I.....25 1897.	6	2-11-97	M	?	S. G.	Difficult excision.	3 mos.					1	1			28th day "Able to use left joint."	Improved.
Bousquet.....27 1895.	7		F	68	S. G.	Head incased in fibrous cell. Was excised by Villar.	1 mo.				1*						No notes.
Dollinger, J....31 1902.	8		?	?	?	Performed Linear Arthrotomy (?)	Old									No notes.	No notes.
Royster, H. A. .39 1907.	9	6-19-07	M	20	S. C.	Arthrotomy. Healed fracture through anatomical neck. Head replaced with fingers and forceps.	2 mos.			Small	1*				1	1 mo. Condition almost perfect. 2 years. Entirely perfect.	Good.
Riedel .....57 1899.	10		....		.....	Reports operating on 2 cases with total destruction of head and 2 cases in which head had reunited laterally to shaft. No details.	Old									Not reported in such a manner that results can be classified.	No notes
	11		....		.....		Old										
	12		....		.....		Old										
	13		....		.....		Old										

* Recurred.

TABLE No. V.—DISLOCATION WITH FRACTURE OF GREATER TUBEROSITY OF HUMERUS.

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Suppuration	Primary union	Result	Result classed as
											Success	Failure	Fracture				
Keen, W. W. . . 11 1907.	1	2-2-07	M	59	S. G.	Immediate reduction of dislocation. 7th day, Gr. tuberosity exposed, drawn into position and nailed down. 2 wire nails used. Protruded through skin. 1 removed in 2 weeks, 1 in 3 weeks.	7 days			Yes					1	1 mo. and 2 days: passive motion just beginning. But little ankylosis.	Fair.
Vaughan, Geo. T. 1903. 12	2	3-21-03	M	60	S. C.	Arthrotomy. A bony material found in glenoid cavity. Removed and found to consist of greater tuberosity. Reduction then easily effected.	2 mos.			No	1	1			1	Great relief from pain. No notes on function.	Improved.
Turner, G. I. . . 18 1902.	3		M	38	?	Unsuccessful efforts to reduce under anæsthetic on 3 occasions. No further notes on treatment.	32 days					1				No notes.	Not stated.
	4		M	60	?	Chloroform at end of 2½ weeks. All attempts to reduce failed. Marked crepitus at outer surface of caput humerui while being rotated. No X-ray. No further treatment permitted.	2½ weeks					1				No notes.	Not stated.

TABLE No. V.—DISLOCATION WITH FRACTURE OF GREATER TUBEROSITY OF HUMERUS.—*Continued.*

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation: Success	Failure	Fracture	Suppuration	Primary union	Result	Result classed as
Wohlgemuth, Heinz.....19 1900.	5		M	60	S. C.	Immediate reduction. Function did not return. 2 years later X-ray showed dislocation reduced, but greater tuberosity located farther upward and outward than normal. Tuberosity touched acromion before arm was raised to level of shoulder. Impairment of movement resulted.	2 years				1					No notes.	Not stated.
Baehr, F. .....22 1898.	6		F	23	S. G.	Unrecognized for 1 month, then reduced (?) Came into hands of B. 3½ months. X-ray showed dislocation and fracture of greater tuberosity. No attempts at reduction.	3½ mos.				1 (?)					11 mos. All movements except bringing arm over back. This was possible but difficult.	Improved.
Dollinger, J....31 1902.	7		?	?	?	Arthrotomy. Tuberosity removed. Dislocation reduced.	?				1					No notes.	Not stated.

Reclus .....28 1904.	8		?	?	S. C.	Unsuccessful attempts to reduce for 3 days. 8th day Heitz–Boyer apparatus caused gradual descent of head. On 4th day gentle manipulation replaced head. Fracture reduced at same time.	Immediate				1				X-ray shows no differences in two humeri. No notes on function.	Not stated
Thomsen, H. L. 37 1904.	9	4-3-03	M	52	S. C.	Immediate efforts to reduce failed. X-ray showed dislocation and fracture greater tuberosity. On 18th day, attempts to reduce again failed. 28th day. Arthrotomy. Difficult reposition.	28 days					1	1		Suppuration for 6 weeks. Complete ankylosis. 8 months. Abduction 30°. Rotation 15°. Deltoid atrophic.	Bad.
Wattson .....46 1889.	10		M	40	S. C.	Arthrotomy. Reduction by leverage with a lithotomy scoop. Removed the tuberosity.	4 weeks			Yes		1			8 mos. Very good. Some impairment.	Improved.
McBurney, Chas. 11 1895. 52		10-25-94	M	?	S. C.	Incision on outer aspect of shaft. Hook inserted. Second hook in base of spine of scapula. Capsule freed with knife and elevator. Reduced. Fracture of greater tuberosity with formation of new bone. This struck edge of glenoid and prevented reduction.	7 weeks	Yes	Success			1			6 weeks. Gradually considerable motion obtained. No doubt but that arm will become very useful.	Improved.
Reidel .....57 1899.	12	1-8-99	M	51	?	Arthrotomy. Gt. tuberosity fractured, displaced downward and united laterally to shaft. Head replaced. Gt. tuberosity chiselled off. Wound left unsutured.	11 days			Yes		1			10 years. Arm strong. Motion in joint without crepitus forward and backward 30–40 degrees. Outward 10 degrees. Rotation minimal.	Improved.

TABLE No. V.—DISLOCATION WITH FRACTURE OF GREATER TUBEROSITY OF HUMERUS.—*Continued.*

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation: Success	Failure	Fracture	Suppuration	Primary union	Result	Result classed as
	13	1891	M	30	S. G.	Arthrotomy. Gt. tuberosity torn off; lsr. tuberosity partly so. Both in glenoid cavity. Head in axilla. Tuberosities adherent below head. Head replaced. Tuberosities and exostoses removed.											
	14	3-31-98	?	?	?	In each case gr. tuberosity fractured and displaced forward and reattached to shaft. Tuberosities were removed, head replaced and wounds packed.	Old			Yes		1				Each case complete ankylosis.	Bad.
	15	6-13-98	?	?	?		Old			Yes		1					Bad.
	16 17 18 19 20 21	?	?	?	?	No detail of these cases except that he operated. See note at end of paper.											Not stated in 5 cases 1 death from secondary hemorrhage.

I have collected since his report, 63 cases, including my own, which gives a total of 180 reported cases.

In my series the fractures have been classed as follows: Of the surgical neck 37 cases; of the anatomical neck 26 cases.

The dislocations are: Subcoracoid 31; subspinous 2; subglenoid 11; not stated 19.

Efforts to reduce by manipulation were successful in 7 cases, of which 3 recurred and 1 was of doubtful success. Failure is recorded in 37 cases, and in 19 cases it is not stated that attempts were made to reduce, but it is quite likely that in every case some effort was made to reduce before resorting to operation.

Fracture or refracture occurred in attempting reduction in 7 instances.

Taking one month as the arbitrary dividing line between recent and old cases, four tables have been prepared: recent dislocation with fracture at the surgical neck, 29 cases; old dislocation with fracture at the surgical neck, 9 cases; recent dislocation with fracture at the anatomical neck, 13 cases; old dislocation with fracture at the anatomical neck, 13 cases.

A table is also appended containing 21 cases of dislocation with fracture of the greater tuberosity.

Where the fracture has not been confined to one or the other neck, or where the line of fracture has not been clearly stated, the case has been classed under one of the above heads as accurately as possible, taking all the circumstances into consideration.

In classifying results, I have adopted the plan of Curtis, who says "In order to obtain an idea of the relative merits of reduction and resection, we must first remember that even the best functional result after resection is not to be compared to the nearly perfect shoulder-joint which can sometimes be obtained by returning the normal head to its natural articulating cavity. The result of a reduction may fall considerably below this perfection and still be as good as the best obtainable after resection. We shall therefore classify the results of reduction as good, fair, and bad, and the results of resection as fair, improved and bad." [6]

SUMMARY.

TABLE I.—RECENT DISLOCATION WITH FRACTURE AT SURGICAL NECK.
(Number of Cases 29)

TREATMENT	No.	RESULT					
		Good	Fair	Impr.	Bad	Died	Not Stated
Arthrotomy and Reduction	18	12	1	1	2	2	
Reduction	4		1	2	1		
Rest and Massage	2		1	1			
Excision	4		3			1	
Not stated	1						1
Total	29	12	6	4	3	3	1

One case is counted twice, Primary Arthrotomy with Reduction, and Secondary Excision.

TABLE II.—OLD DISLOCATION WITH FRACTURE AT SURGICAL NECK.
(Number of Cases 9)

TREATMENT	No.	RESULT					
		Good	Fair	Impr.	Bad	Died	Not Stated
Excision	5		1	3			1
Dislocation Untreated	2		1		1		
Massage and Electricity	1				1		
Riberi	1				1		
Total	9		2	3	3		1

TABLE III.—RECENT DISLOCATION WITH FRACTURE AT ANATOMICAL NECK.
(Number of Cases 13)

TREATMENT	No.	RESULT					
		Good	Fair	Impr.	Bad	Died	Not Stated
Excision	6		3	2		1	
Arthrotomy and Reduction	3	1	2				
Reduction	2	1					1
Rest and Massage	2			1	1		
Total	13	2	5	3	1	1	1

TABLE IV.—OLD DISLOCATION WITH FRACTURE AT ANATOMICAL NECK.
(Number of Cases 13)

TREATMENT	No.	RESULT					
		Good	Fair	Impr.	Bad	Died	Not Stated
Excision	6		2	3			1
Arthrotomy and Reduction	2	1					1
Linear Arthrotomy (?) Riberi	1						1
Not clearly stated	4						4
Total	13	1	2	3			7

CONDENSED SUMMARY OF ALL CASES.

(Number of Cases 63)

Treatment	No.	Result					
		Good	Fair	Impr.	Bad	Died	Not Stated
Arthrotomy Reduction	23	14	3	1	2	2	1
Excisions	21		9	10		2	
Reduction by Manipulation	6	1	1	2	1		1
Rest and Massage	5		1	2	2		
Dislocation not treated	2		1		1		
Riberi Method	2				1		1
Not stated	5						5
Total	64	15	15	15	7	4	8

(See note at foot of Table I, one case counted twice.)

From the condensed tables we find 23 cases of arthrotomy with reduction, and 14 good results, 60.8 per cent., against 21 resections with 9 fair results, 42.8 per cent. The cases classed as "good" include those where there is practically no impairment of function, and in several instances it is distinctly stated that there was perfect restoration.

Those cases of resection classed as "fair" include the best results to be obtained after resection. If no distinction were made and they were all classed as "good," there would still be a large difference in favor of arthrotomy and reduction. The results in Table No. I, early arthrotomy in dislocation with fracture at the surgical neck, show 18 operations with 12 good results, and to this should be added McBurney's first case, which is not included in this series, making 19 cases with 13 good results, 68.5 per cent. If we combine the results in Tables I and III and add McBurney's case, we have 22 recent cases of arthrotomy and reduction with 14 good results, 64 per cent. Let it be borne in mind that the tables of recent cases include everything within the first month after injury, and it will be apparent that a much higher percentage of perfect recoveries would follow immediate operation in all cases which manipulation failed to reduce.

The problem of dealing with dislocation with fracture at the anatomical neck differs in some respects from that

encountered when the fracture is at the surgical neck. In either event, delay in reducing the dislocation will make that part of the treatment more difficult. Union of fracture at the anatomical neck is much more apt to fail than when the fracture is at the surgical neck. When the fracture is at the anatomical neck and the head is entirely separated, it is cut off from all its blood supply, and while theoretically one would expect it to undergo necrosis if not at once restored, still Gray says that this must be an exceedingly rare occurrence, and Gurlt was unable to find a single authenticated case on record.[59] However, if the head remains detached from the shaft long enough for the ends of the bone to become smoothed over, as was the case with Keen's patient, the upper fragment is too small to permit of freshening as might be done with a fracture at the surgical neck, and excision will have to be practiced. For this particular reason, I do not agree with the statement of Curtis that a delay of from one to four weeks will not impair the result.[e]

If any infection is introduced in performing arthrotomy, the separated head, on account of its poor blood supply, will almost certainly undergo suppuration and necrosis, requiring secondary excision. After reduction, the head should be attached to the humerus by suture or nails.

Dislocation complicated by fracture of the greater tuberosity was considered very unusual until the X-ray came into general use, and fracture of the greater tuberosity alone was thought to be even more rare. Keen was able to present to the Philadelphia Academy of Surgery in March, 1907, 23 skiagraphs of this fracture alone or associated with other injuries. These he collected from the different hospitals of Philadelphia, and at the same meeting reported a case of dislocation with fracture of the tuberosity in which he nailed the tuberosity in place after reducing the dislocation. In going over the literature of dislocation of the shoulder with fracture of the neck of the humerus, I have collected 21 cases of dislocation with fracture of the greater tuberosity. No attempt has been made to make this collection exhaustive, and only

those cases have been recorded which have come under my notice while studying the other subject. The fractured tuberosity is often an obstacle to the reduction of what may appear to be a simple dislocation. With only the tuberosity fractured, the humeral shaft is still available as a lever in reducing the shoulder dislocation, but the tuberosity frequently becomes detached and is displaced between the head of the humerus and some of the overhanging processes of the scapula, acting as an obstacle to the return of the head of the humerus to the glenoid cavity. If left untreated and displaced, even if the dislocation is reduced, the fragment will either attach itself to the humerus in some abnormal position, thereby impairing some of the motions of the joint, or may be drawn into the capsule and become attached somewhere inside the joint cavity to interfere with the free movements of the shoulder.

The histories of the 21 cases in my series show the following treatment and results:

TREATMENT OF DISLOCATION.

TREATMENT	No.	RESULT					
		Good	Fair	Impr.	Bad	Died	Not Stated
Reduction	2			1			1
Arthrotomy and Reduction	9		1	5	3		
Left unreduced	3						3
Reduced by Heitz-Boyer Apparatus	1						1
Not clearly stated	6					1	5
Total	21		1	6	3	1	10

TREATMENT OF FRACTURED TUBEROSITY.

Nailed in position	1
Removed	7
Untreated	4
Replaced by using Heitz-Boyer apparatus	1
Not stated	8
Total	21

Reidel states that he has operated on 15 old irreducible dislocations of the shoulder, and found 14 of them associated

with fracture and only one case uncomplicated. Of the 14 cases, 10 showed fracture of the greater tuberosity.

We see, therefore, that dislocation is often rendered irreducible by the presence of a fractured tuberosity, and that, with dislocation reduced and the fracture untreated, there is often impairment of the function of the joint. The great value of the X-ray in clearing up all injuries of the joint cannot be too strongly urged, and we should employ the rays in every case.

In early cases the dislocation should be reduced by manipulation, if this can be accomplished with gentleness, and the tuberosity should be treated by nailing into position as Keen recommends.

If this treatment should prove unsuccessful, the dislocation should be treated by arthrotomy and reduction, and the tuberosity should be nailed down in its proper position. It should be removed if it cannot be replaced. In old cases, it will be necessary to perform arthrotomy, remove exostoses and tuberosities united in abnormal positions, and then reduce the dislocation.

In those injuries where the whole upper extremity of the humerus is crushed, no general plan of treatment can be laid down, and the judgment of the operator must dictate the plan of procedure.

Excision, however, gives, oftentimes, very useful arms, and is to be preferred to allowing the cases to go on to probable ankylosis with excessive callus thrown out around badly displaced fragments.

Conclusions.

1. Every dislocation of the shoulder associated with fracture of the upper extremity of the humerus is a grave injury, and is likely to result in serious impairment of function if not promptly treated.

2. Every such injury should be subjected to X-ray examination for accuracy in diagnosis.

3. Gentleness should characterize all manipulative efforts

at reduction, and these should never be carried to the point of bruising or lacerating the tissues.

4. Excision should only be practiced when reduction by open arthrotomy has failed, or where there is extensive communication of the upper extremity of the humerus, or when, in fracture at the anatomical neck, the condition of the upper fragment does not justify a reasonable expectation of uniting.

5. After reduction, the broken greater tuberosity should be nailed into position if the case is recent, and should be removed if it causes impairment of function in an old case.

6. Failing to reduce by manipulation, immediate arthrotomy with reduction of the dislocation, followed by appropriate treatment for the fracture, has given the best results, and is the ideal method of treatment.

7. Rigid asepsis is essential in securing good results, and these operations should not be undertaken where this cannot be carried out.

NOTE.

Reidel's 14 cases are reported in such a manner that they can hardly be classified under any of my headings, so the following is abstracted from his excellent paper. He operated 15 times where reposition could not be accomplished, and found that 14 of the cases had sustained fracture at the same time. In some there was total destruction of the dislocated head; in two cases fractured head of the humerus had united laterally to the shaft; the greater tuberosity was torn off alone in 4 cases, associated with fracture of the lesser tuberosity in 6 cases. In all cases of fractured tuberosity large bony protuberances had formed owing to periosteal proliferation. He treated 7 of the 15 cases by primary resection. All terminated favorably except one, aged 70, who died from hemorrhage on 6th day. He mentions that four of nine operative repositions failed and had to be followed by secondary excision. In 5 cases operative reposition was successful, one case not complicated by fracture.[87]

(Some of his work must have been a good many years ago, as one of the cases he reports was operated on in 1889, and he seems to have gotten a considerable amount of suppuration. Reference to his paper shows that he treated many of his cases by packing, and in some instances states that the wounds were not sutured. His open treatment was conducive to adhesions and ankylosis and it is not surprising that he had some very poor results. It must be remembered, too, that he was dealing with old cases, and more extensive operative work was necessary than in recent cases.)

Addenda.

Since the completion of this paper, I have found the reports of two cases of fracture-dislocation operated upon by Schlange. One was fracture of the surgical and one of the anatomical neck; each case was operated on within the first 24 hours and the results were good.[67]

In the 5th edition of Stimson's work on fractures and dislocations, recently published, he mentions without details, two cases in which he practiced excision of the head of the humerus.[68]

On Jan. 6, 1908, it was my good fortune to see, in consultation with Drs. W. P. McAdory and M. A. Copeland of this city, a case of backward dislocation of the left shoulder with fracture of the surgical neck. Dr. McAdory operated on the 5th day after the injury, reducing the dislocation and wiring the broken bone. The history of the case, together with the result will be reported by him when the patient has recovered.

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A TREATMENT OF EPIPHYSEAL DISPLACEMENTS AND FRACTURES OF THE UPPER EXTREMITY OF THE HUMERUS DESIGNED TO ASSURE DEFINITE ADJUSTMENT AND FIXATION OF THE FRAGMENTS.

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In characteristic cases of epiphyseal separation of the head of the humerus, or similar fractures in later years, one notes a sharp projection below and in front of the acromion process which represents the anterior and upper extremity of the shaft, the head being relatively below, within, and behind it.

In many of the reported cases this projection has been mistaken for a dislocation and unavailing attempts have been made to reduce it, the deformity reappearing when the arm is placed by the side. Nor does a correct diagnosis lessen materially the difficulty of treatment. To quote Hamilton, "It is proper to say, that complete reduction is seldom accomplished and permanently maintained, owing probably to the advantageous action of the muscles which tend to produce the displacement, and in part also to the difficulty of applying any apparatus or dressing which shall act efficiently on the fragments."

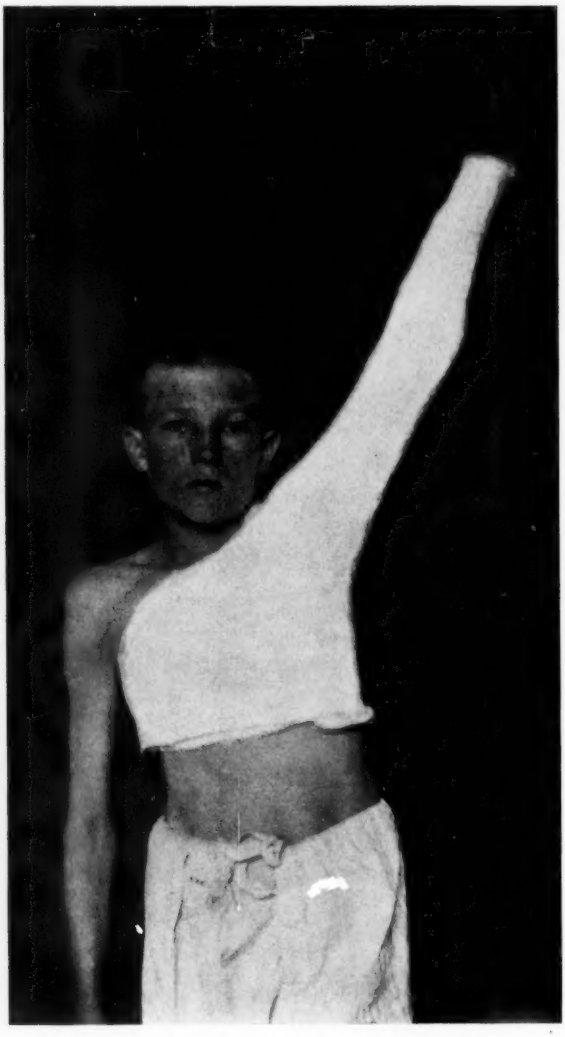
About six years ago, a girl seven years of age was brought to the Hospital for Ruptured and Crippled who presented the typical signs of epiphyseal fracture, the injury having been received two weeks before.

In this case I first employed the method of treatment similar in principle to that which I have used successfully for the corresponding injury at the hip-joint, namely, to reduce the displacement by leverage of the extremity and to appose the fragments by adjusting the attitude of the limb to conform to the separated head, or essentially in full abduc-

FIG. 1.

Fracture of the arm in complete abduction. Photograph of the first patient treated in March 1902.

FIG. 2.



The shoulder spica fixing the arm in extension, abduction and elevation.

tion, the alignment being aided by manipulation of the inner fragment and by tension on the capsule and the surrounding muscles.

The details of the method are as follows: The patient having been anæsthetized, the adherent fragments are separated by forcible manipulation. The head is then grasped, as well as may be, by the fingers and under traction the arm is abducted gradually to the extreme limit, the acromion serving as a fulcrum to direct the extremity of the diaphysis downward toward the epiphysis. When the fragments are in apposition the abducted arm may be drawn somewhat forward, if necessary, to assure proper adjustment. One now proceeds to fix the parts in this attitude by means of what may be called a shoulder spica. This, as applied to the original case, is illustrated in Fig. 1. A better method, the one used in the second case, that of a boy twelve years of age, in which the reduction undertaken twelve days after the injury was somewhat more difficult, and now recommended, is shown in Fig. 2. The extended arm is raised over the head by rotation of the scapula so that one may better utilize muscular tension and the force of gravity to fix the fragments.

In my experience, union after epiphyseal displacement is prompt. Thus, after several weeks, the apparatus may be removed, to permit massage and appropriate exercises. In the limited number of cases that I have treated by this method, function has been perfectly restored.

If the fragments have become so adherent that they can not be separated, or if for any reason adjustment is unsatisfactory, the joint should be opened, but the advantage of the attitude and the method of fixation will then, I think, be even more apparent.

In the ordinary mode of treatment after an attempt has been made in one way or another to adjust the fragments, the arm is fixed to the body or in some indifferent attitude in which the complete or partial redisplacement is, from the nature of the injury, almost certain. The effect of this deformity is to limit abduction by contact of the upper extremity

of the humerus with the acromion and by pressure of the displaced head on the lower border of the capsule. It may be assumed also, that, aside from the impairment of function, a certain loss of growth may be expected unless the cartilage is replaced in fair relation to the diaphysis.

I have limited myself thus far to the class of cases in which I have had actual experience, but the same treatment may be utilized for fractures in this neighborhood in older subjects. It seems to me, that like the similar method which I have urged for treatment of fracture of the neck of the femur, it should appeal to those who appreciate the nature of the obstacles that make the treatment of fractures in these situations so difficult and the results so unsatisfactory.

I may mention incidentally, that what has been called the shoulder spica, is a convenient and almost indispensable means for fixing the arm after operation for lateral deformity at the elbow, or whenever one desires to hold the arm securely in the extended attitude without confining the patient to bed, the elevation preventing the œdema that is almost inevitable if the limb is pendant.

TRAUMATIC SUBLUXATION OF THE HUMERUS.

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HOWEVER frequent the deformity shown in the accompanying photograph may be in the experience of those of large opportunities, I cannot find a similar illustration in medical literature.* Fifty years ago, before operative technic held the centre of the stage in surgical matters, subluxation of the humerus was a subject of considerable discussion, but under that heading there are comparatively few references exactly applicable to the case here shown—indisputably a subluxation.

Sir Astley Cooper,[1] about one hundred years ago, in his treatise on dislocations, added subluxation of the humerus to the three varieties theretofore accepted: down and inward, forward under pectoral muscle, and backward on to the dorsum of the scapula. He detailed two cases of subluxation. He writes: "I believe this is not a very rare accident and shows itself by the following marks: the head of the bone is drawn forward against the coracoid process, there is a depression opposite the back of the shoulder-joint, and the posterior one-half of the glenoid cavity is perceptible from the advance of the head of the bone; the axis of the arm is thrown inward and forward; the under motions of the limb are still capable of being performed, but its elevation is prevented by the head of the humerus striking against the coracoid process. There is an evident protuberance formed by the head of the bone in its new situation, which is felt readily to roll when the arm is rotated." He permitted a discrepancy to enter into his description, however, by citing the one dissection he had seen, of this injury, in which the head of the bone was under the

* The exhaustive article of J. William White on displacement of the long head of the biceps might be regarded as an exception to this statement (Am. J. Med. Sc., 1884, p. 1).

coracoid process—simply an unreduced subcoracoid dislocation, a variety not then recognized.

This description of a partial dislocation of the head of the humerus precipitated a controversy which has cropped out from time to time in medical literature up to 1894. There was an academic discussion of what constituted a subluxation —this we find continued even as late as an 1891 edition of Hamilton's Treatise on Fractures and Dislocations.

Malgaigne [2] marvelled that so great an anatomist as Sir Astley Cooper should make the mistake of assuming there was room for the head of the humerus between the glenoid fossa and the coracoid process. However he states that Petit, from the clinical aspects, appeared to have been disposed to admit incomplete luxation of the humerus, and that Chopart thought he had encountered one instance. Malgaigne was willing to retain the term but restricted it to subcoracoid dislocations in which the articular surface of the head of the humerus rested on the anterior glenoid border. Two such cases he had dissected; in both there was a sulcus on the head of the bone, marking the site of its contact with the glenoid border, and as in one case the autopsy was only four days after the receipt of the injury he concluded this sulcus due to the impact of the head of the bone against the glenoid border at the time of the injury. Such a sulcus then indicated a subluxation as he defined it. Sedillot [3] on the contrary believed that in all unreduced subcoracoid luxations the natural and final position of the head was in contact with the glenoid border, the sulcus resulting from long-continued pressure of the head in this new position.

Such subluxations, however, as defined by Malgaigne, are not of clinical interest because symptomatically indistinguishable from complete subcoracoid luxation.

In 1834 Laugier [4] reported a subluxation of the humerus upward and forward. The patient presented himself at the Necker Hospital with a considerable swelling of the left shoulder; the elbow could be approximated to the side of the chest, and anteroposterior movements of the arm were pos-

sible, though quite painful. Not for twelve days did this surgeon suspect it was more than a sprain; an examination at the end of that time, however, after the swelling had in a great part disappeared, revealed signs which for the first time suggested a partial displacement of the humerus. The head formed a prominence within and above, on a level with the coracoid process, behind which it was applied; between the head and the arch of the acromion there existed a depression, but little marked to the eye, yet in which could be lodged the tips of one's fingers. The axis of the arm was inclined, and slightly rotated outward on its long axis, so that the internal tuberosity of the head seemed to project in front. The most difficult movement was elevation of the arm and it was seen that this was a movement of the entire shoulder—the head resting against the coracoid process caused the scapula and clavicle to be elevated as one piece; the member was shortened 5 or 6 lines. Efforts at reduction at the end of fifteen days were without success.

Malgaigne probably allots more space to the discussion of subluxation of the humerus than any other systematic writer. Concerning Laugier's case he has this to say: "It is not rare to have in scapulaglias" ('Scapulalgies'),—an equally vague term in both English and French,—"which have become chronic, a subluxation forward and upward, which has acquired a certain importance on account of the mistakes to which it has given rise. The humeral head is elevated until it is almost in contact with the acromion, and is carried forward against the external border of the coracoid process; there is found in consequence a depression under the acromion, shortening of the arm, and limitation of its movements. It is really this condition, unless I mistake it, which Laugier has described as an incomplete upward and forward luxation, produced by traumatism."

Hamilton[5] devotes greater space to subluxation of the humerus than is found in any more recent treatise. It is possible in the following paragraph he refers to the same class of cases described by Malgaigne as chronic scapulalgies:

"The head of the humerus sometimes remains for a long time after the reduction of a dislocation has been effected, slightly advanced in its socket, so as to lead to the suspicion that it is not properly reduced. The same thing also has been noticed by me where the shoulder has been subjected to a violent wrench, but no actual dislocation has ever occurred. In either case the explanation is perhaps the same—the long head of the biceps has been broken or displaced; or when it follows a dislocation, some of the muscles inserted into the greater tuberosity have been torn from their attachments; yet the laceration of the capsule and the action of the muscles may alone be concerned in the production of this phenomenon."

In the Centralblat fur Chirurgie, 1894, is an article by Paul Müller,[6] on traumatic subluxation of the humerus, which stands quite alone. Without much discussion of previous opinions he states simply his own: that the condition is more frequent than generally accepted. In three years he had seen five cases of omoplegia reflexa traumatica, as he would otherwise term it. The first patient consulted him on the fourteenth day after falling down several steps onto the left shoulder. There was immediate loss of the use of the arm, considerable swelling and pain. On the fourteenth day following, the patient presented himself: the elbow was supported with right hand; rotundity of shoulder was gone; the upper arm was rotated in, but a deviation of the upper arm axis from the glenoid cavity toward clavicle was not noticeable; no abnormal protrusion of the scapula; flattening of the shoulder posteriorly was plainly seen; the finger-tip could be pushed deep under the acromion process; the head of humerus was advanced about 2 cm. and closely applied against the coracoid process; the deltoid was slack. Active motion was impossible and passive motion painful; the displacement could be reduced but immediately recurred. Under chloroform there was free passive motion on replacing head; no exudate in the joint was demonstrable. The other cases were similar; the flattening of the shoulder was not at first seen, though in one case it was noted as early as the third day; this he thinks partly due to the con-

siderable swelling but chiefly to the fact that the subluxation is a secondary circumstance. The injury produces, Müller thinks, a reflex atrophy of the deltoid, supraspinatus and usually also the infraspinatus and teres minor—which in one case were markedly atrophied—through irritation of the sensory joint branches of the axillary and suprascapular nerves—the unopposed pull of the pectoralis major, latissimus dorsi and subscapularis producing the abnormal position of the head.

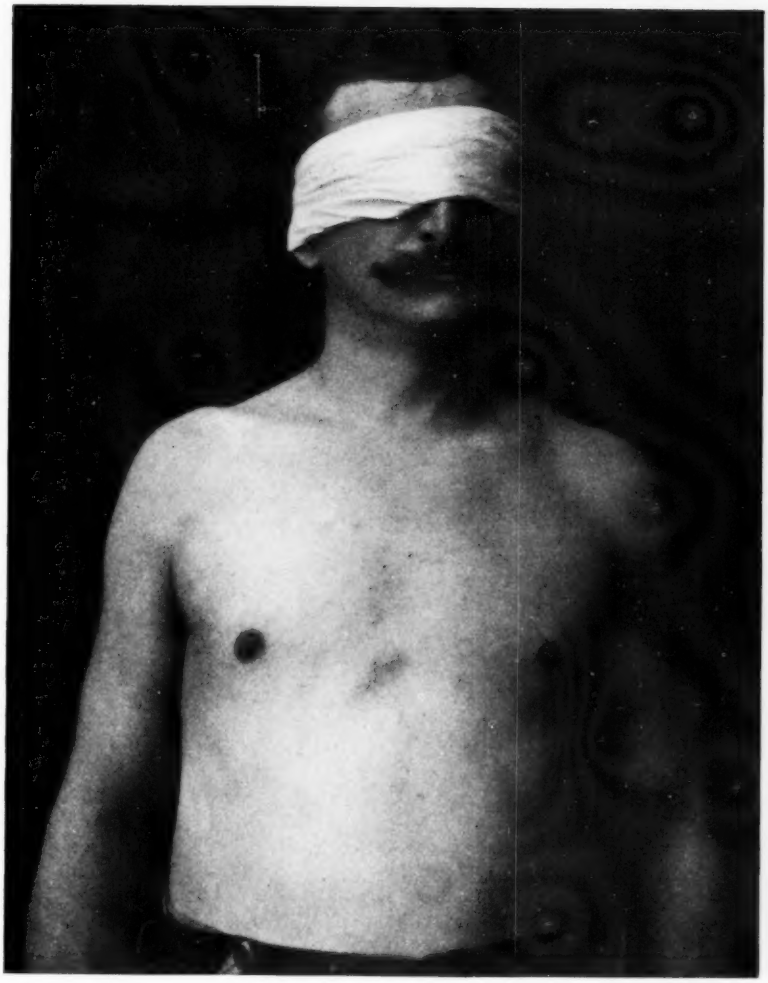
A case described by Snodden [7] in 1839 is of particular interest because of the findings when it came to autopsy six months later, from other causes. This patient fell backward, receiving the weight of the body on the right elbow; the shoulder, however, sustained the entire effect of the injury. The following morning the shoulder-joint was swollen and tender to touch and painful on very slight rotation; he could not place the arm over his head, though this was possible immediately after the injury. At the end of three weeks the swelling was less, but the tenderness, and pain on certain movements, had scarcely abated at all. There was a slight flattening on outer and posterior aspects of the joint, and the head of the bone looked as if it were drawn up higher in the glenoid cavity than it should be. "The head of the bone was unduly prominent in front, almost to the amount of a partial dislocation." Abduction was limited to a very acute angle by the greater tuberosity coming in contact with the acromion. "For all useful purposes the arm was powerless—the man was unable to raise the smallest weights from the ground; otherwise, the underhand motions were not limited, the arm could be readily swung forward and backward. The locking of the humerus and acromion on abduction formed an insuperable opposition to all overhand motions." The interesting finding at autopsy six months later was the dislocation of the long head of the biceps, from its groove, without other injury. From the close resemblance of this case to partial luxation of the humerus, Snodden was led to inquire how far a lesion of this tendon is involved in the production of subluxation. But in the seventy years which have elapsed, that inquiry has not been

definitely answered, for no similar clinical history has been recorded, followed by an autopsy record. Agnew [8] was among those to answer it negatively. He writes: "I have in at least three instances seen the condition present which is said to characterize this supposed displacement; and from the nature of the precedent injuries, I have been disposed to refer the anterior fulness on the inner aspect of the joint to the loss of power in the posterior scapular muscles, in consequence of which the head is drawn unusually inward by the subscapularis, and inward and upward by the clavicular fibres of the pectoralis major and deltoid muscles, and likewise, though in less degree, by the coracobrachialis and short tendon of the biceps."

After the report of Snodden's case, in the discussion of subluxation was incorporated renewed speculation as to the part played by the long head of the biceps in maintaining the head in its normal position and the symptoms resulting from its rupture or dislocation. This aspect of the discussion was based chiefly upon dissecting-room findings. Many different opinions were expressed: some that partial dislocation forward was due to rupture or dislocation of the long head of the biceps [9]; some that luxation of the long head of the biceps does not occur at all and cases so described are really instances of inflammatory swelling of the subdeltoid bursa [10] (Codman, Bost. Med. & Surg., May 31, 1906, recently called attention to the disability produced by inflammation of this bursa); some that the changes noted were the result of rheumatoid arthritis, etc., *i.e.*, that the luxation was pathological and not traumatic.

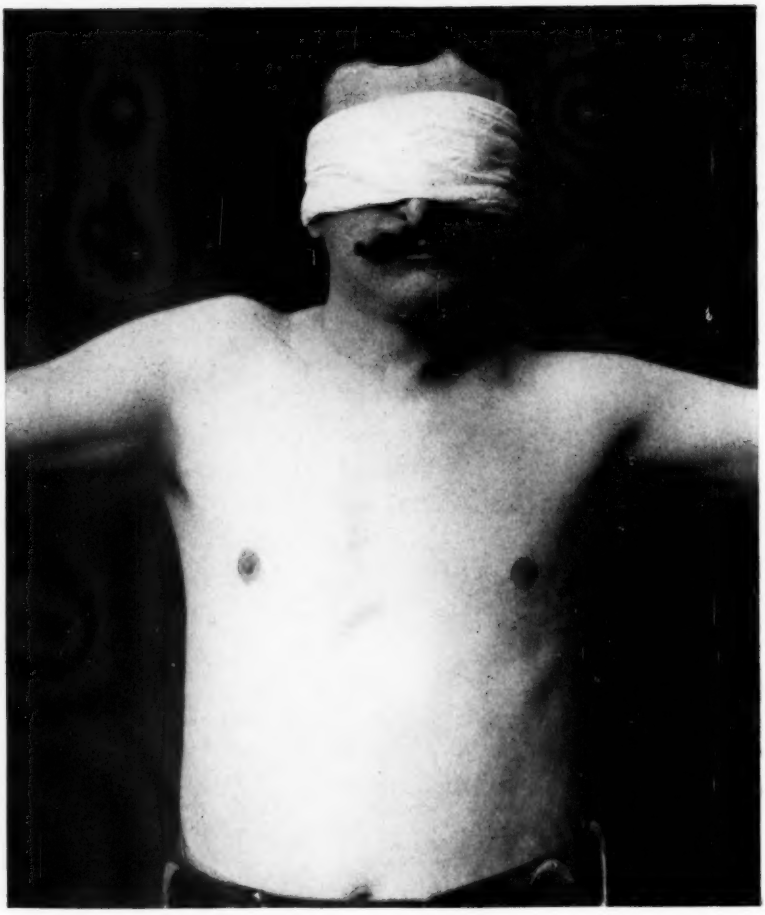
The subject of the accompanying photographs received this injury in a fall from his bicycle, on to the outstretched hand. It was regarded and treated as a sprain; all redness and swelling subsided in two or three days. Voluntary motion was abolished at first, but the next morning after a little massage some motion was possible. At the time of my first examination, seven and a half weeks after the accident, the use of the arm was so painful and limited he had not been able to return to his work as a plate printer. The under motions of the arm anteriorly were

FIG. 1.



Traumatic subluxation of the humerus.

FIG. 2.



Traumatic subluxation of the humerus.

unrestricted, but not so posteriorly. The greatest difficulty, however, was in raising the arm beyond the horizontal; extending the arm in front, if assisted beyond the horizontal he could continue to raise the arm to the perpendicular, and voluntary movements again became freer. On comparing the two shoulders it was readily noted that the head of the humerus on the injured side was more prominent anteriorly, and on a higher level (Fig. 1).* A corresponding flatness posteriorly was not so noticeable. On extending the arms laterally to the horizontal, the deformity shown in the second photograph (Fig. 2) immediately attracted attention; the greater tuberosity seemed to lock against the acromion process, impeding further independent movement of the humerus, beyond the horizontal. An X-ray negative showed there was no injury to the bony structure. Six months later the deformity had entirely disappeared and though the functional restoration was not perfect it was nearly so.

I had advised the patient he would probably recover the use of his arm in six months or a year, but having in mind the part the long head of the biceps was said by some to play in such cases, I thought possibly his convalescence might be shortened by an effort to repair that tendon, if ruptured. He sought other advice and decided against any operative interference, and I lost the opportunity of throwing some light on the pathology of this subluxation. One dissection convinced me a study of dissecting room material would not enable me to add anything to the contributions already made from such sources, and that an autopsy *in vivo* would alone clear it up.

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* The subluxation of the acromial end of the clavicle, readily seen in the first photograph, seemingly played no part in his disability.

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OCCLUDING PULMONARY EMBOLISM.

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CONSIDERING the fact that it was not until the first quarter of the seventeenth century that the circulation of the blood was established it is not surprising that over two hundred years more should have elapsed before it occurred to any one that this flowing stream could act as a means of transportation for solid particles set free in its current, and that such particles introduced into the blood might be found in some place other than the point of entry.

So simple is the mechanism of thrombosis and embolism as it is taught to-day that we wonder why it was necessary for Virchow to establish the self-evident fact that injury to a vessel or changes in the blood sufficient to cause clotting at some particular point might be followed by dislodgement of a piece of this solid clot and that this broken off mass would be carried on by the blood stream until it reached a vessel too small for it to pass through and then stop. It is also plain that the blocking of a vessel by this solid mass would stop the circulation through this vessel and give rise to disturbances of great importance or of little importance depending on whether or not this vessel supplied an organ, the function of which was necessary to maintain life.

In this paper we desire to discuss especially the instances in which venous thrombosis, in either medical or surgical cases, is followed by emboli of sufficient size or number to block completely the more important branches or the main stem of the pulmonary artery and cause sudden death.

These cases, which we are to discuss, of complete blocking of the pulmonary artery by large masses of clot derived from a thrombus in a vein, which are frequently encountered by the surgeon near the operative area and which may result in death are by no means uncommon. They occur most frequently between the second and fourth weeks following the operation. The patient may die instantaneously or there may be a more or less prolonged respiratory struggle ending in death. This depends on whether the detached mass goes through the right heart intact in sufficient size to completely block the stem of the pulmonary artery or whether the first mass partially blocks the artery, or blocks one of its main divisions, and is followed by other masses, or coagulation of blood behind the first. If the trunk of the pulmonary artery is blocked so that both the main branches are closed death ensues immediately. In individuals suffering from weakened heart action of any cause sudden blocking of one of the main branches of the pulmonary artery may also result in sudden death. Strong heart action on the contrary may overcome the effect of the blocking of one of the main branches of this artery and the patient survive.

The autopsy findings in these cases so far as the lungs are concerned are scant. Occlusion of the trunk of the pulmonary artery does not give rise to infarction of the lungs. Infarction of the lung is only present when emboli have lodged in the smaller branches of the pulmonary artery. Cases are seen in which small emboli have preceded the final lethal embolus and caused hemorrhagic infarction of the lung, but these infarctions have no immediate part in causing death in such an instance. Only rarely are they found in connection with the type of pulmonary embolism with which we are dealing and then usually when there is thrombosis of several veins at the operative site. Any of these thrombi may give rise to emboli and a small embolus might have been carried to the lung at any time from one of these thrombi wholly independent of the embolus that caused death.

In autopsies on cases of death from pulmonary embolism

the pulmonary artery should always be opened *in situ* before the heart is removed or cut into, as the site of the embolus is usually at the point where the vessels are cut in removal of the heart. If this is not done, the embolus, which may have had no time for attachment, can easily slip out unobserved and be entirely overlooked by the pathologist.

The origin of the embolus, while it might come from any part of the systemic venous system or the right heart, is most frequently found in the veins of the lower extremities; in the deep epigastric and pelvic veins; or in the mesenteric veins. In our medical cases the thrombus was found the most times in the right heart.

Albanus gives as prevailing causes for thrombosis after laparotomies, sepsis, heart imperfections, pressure of tumors on veins; cooling and handling of blood vessels while the abdomen is open; the effect of narcosis on the heart; the recumbent position and the pressure of a bandage. He overlooks what we believe to be a most fruitful cause of the condition, varicosities on veins which are directly affected by the operation. On the operating table it is not uncommon to see greatly changed veins carrying the blood from large tumors and in one instance at least, No. 2 of our series, we were able to demonstrate both at operation and autopsy these varicose veins and their causal relation to fatal embolism.

All lung symptoms, according to Gussenbauer, which arise after the release of incarcerated hernia are to be regarded as embolic in nature. Other surgeons go equally far in connecting this subject with abdominal surgery. It is the practice of the Mayos when resecting the stomach to invariably cauterize the cut edges of that viscus to prevent septic pulmonary embolism. (Personal communication.) Since doing this, they see pneumonic emboli following such operations less frequently than formerly. As Albanus, quoted above, states, sepsis is naturally to be thought of as a factor in these cases. Hence one is not surprised at the remark of Sonnenburg, that 5 per cent. of all appendix operations are attended with thrombosis somewhere in the vicinity.

The reason for the greater number of cases given in the literature as showing thrombi originating from the femoral, epigastric and pelvic veins, as far as the surgeon is concerned, is due to the fact that pelvic and abdominal operations are much more frequently performed than operations in other parts of the body. Operations elsewhere, where veins are subject to trauma or infection are as apt to be followed by thrombosis and subsequent pulmonary embolism as they are in the before mentioned situations. This may be illustrated by the following case.

('05.7) Male, age 70 years. *Larynx removed for carcinoma. Eight days later sudden death.* Autopsy four hours after death showed the trunk of the pulmonary artery occluded by partially organized blood clot, 1.5 cm. in diameter. The clot extended into both the main divisions of the artery. The lungs were œdematous and congested. The right heart was distended and filled with blood. The neck was swollen and œdematous. Operative wound at site of larynx showed some superficial necrosis with healthy appearing granulation tissue below. On the right side, the internal jugular vein was distended to a diameter of 3 cm. and was occluded by a solid grayish granular thrombus for a distance of 8 cm. The neighboring tissue was stained by blood pigment. Anatomical diagnosis. Thrombosis of internal jugular vein with resulting occluding embolism of pulmonary artery.

The frequency of pulmonary embolism (including the cases of embolism of the smaller branches of the pulmonary artery that give rise to little or no permanent after-effect) is much higher than is usually supposed in both surgical and non-surgical diseases. Virchow found that in ten cases of thrombosis of the veins of the lower extremity, six were followed by pulmonary embolism. Albanus found that 43 per cent. of the cases showing thrombosis after laparotomies were followed by pulmonary embolism. (This amounted to only 2 per cent. of the operated cases since only 53 cases of thrombosis were found in 1140 laparotomies; 23 of which were followed by pulmonary embolism.) On the contrary Quenstedt and

also Leichtenstern found pulmonary embolism in 20 per cent. of their cases of thrombosis. Opposed to this again is the record of Lubarsch, who in 584 cases of thrombosis found pulmonary embolism 347 times, *i.e.*, in 59.1 per cent. of his cases.

In none of these instances is it stated how frequently the embolus was of sufficient size to cause death by blocking the pulmonary artery. These cases are not rare and from those that have been reported a few may be cited.

Welch has collected twenty-three cases of venous thrombosis in which there were at least 3 deaths due to pulmonary embolism consecutive to the thrombus. Mynter mentions a case in which sudden death was probably due to pulmonary embolism following thrombosis of the femoral vein in appendicitis. Robinson describes a typical death from pulmonary embolism seventeen days after hysterectomy. Koenig reports a case where the patient died from pulmonary embolism although the thrombosed vein (saphenous) had been removed for the purpose of avoiding just such an untoward outcome. In this instance the clot probably extended into the femoral vein and was therefore not totally extirpated.

From the cases that have occurred in the practice of one of us and from cases that came to autopsy at the Boston City Hospital, most of them during the service of Dr. Thompson, and for which we wish to express our indebtedness to Dr. F. B. Mallory, we append the following list.

1. *Carcinoma of Larynx.*—(Autopsy, Thompson.) Death instantaneous eight days after operation. Occlusion of main stem of pulmonary artery by embolus. Thrombosis of internal jugular vein.

2. *Myoma of Uterus.*—(Autopsy, Thompson.) Death sudden thirteen days after operation. Occlusion of both branches and trunk of pulmonary artery by embolus. Thrombosis of ovarian veins.

3. *Compound Fracture of Leg.*—(Autopsy, Thompson.) Death thirty minutes, eight days after injury. Main trunk and right pulmonary blocked by embolus. Thrombosis right heart. Culture from heart's blood sterile.

4. *Contusion of Knee.*—(Autopsy, C. W. Duval.) Time in dying thirty minutes. Embolus of trunk and branches of pulmonary artery. Thrombosis of right femoral.

5. *Appendectomy.*—(Autopsy, Dr. Brinkerhoff.) Death in five minutes, eight days after operation. Complete embolism of main trunk of pulmonary artery. Abscess at appendix site.

6. *Gangrene of Heel; Myocarditis; Alcoholic Neuritis.*—(Autopsy, Dr. S. B. Wolbach.) Eleven hours in dying. Embolism of branches of pulmonary artery except branch to upper lobe of right lung. Thrombosis of femoral, external pudic and profunda. Culture from heart's blood sterile.

7. *Appendectomy.*—(Autopsy, Dr. Marchildon.) Died in ten minutes, fifteen days after operation. Occlusion of both branches of pulmonary artery by embolus. Thrombus not found.

8. *Uterine Myomata and Gall-stone Disease.*—(Autopsy, Dr. Tiedeman.) Six days after operation collapse with recovery: four days later another attack of similar nature, and in two more days (two weeks after the operation) pulmonary embolism with death in thirty minutes.

9. Clinical Diagnosis *Hemorrhagic Pleurisy.*—(Autopsy, Dr. Brinckerhoff.) Autopsy findings scant save for thrombosis of left pulmonary and popliteal arteries. Embolism of right pulmonary. Death sudden. Culture from thrombus show colon-like bacillus.

10. *Tuberculosis of Lungs.*—(Autopsy, Thompson.) Embolism of left pulmonary artery. Two hours in dying. Cultures from heart's blood show streptococcus.

11. *Bronchopneumonia and Acute Otitis Media.*—(Autopsy, Thompson.) Embolism both branches of pulmonary artery. Five hours in dying. Culture from heart's blood sterile. Middle ear streptococcus and staphylococcus aureus.

12. *Typhoid Fever.*—(Autopsy, Dr. E. E. Southard.) Complete blocking of pulmonary artery by embolus. Death in fifteen minutes. Thrombosis of right common and internal iliacs.

13. *Myocarditis; Aortic Endocarditis; Hypertrophy and Dilatation of Heart.*—(Autopsy, Thompson.) Embolism of branches of pulmonary artery to lower lobes only, with hemorrhagic infarction. Twelve hours in dying. Thrombosis of right heart. (Death in this case due to weak heart as embolism not sufficient to cause death under ordinary conditions.)

14. Similar to last case. *Myocarditis; Hypertrophy and Dila-*

tation of Heart.—(Autopsy, Dr. H. A. Christian.) Embolism of branches of pulmonary artery with hemorrhagic infarctions, both lower lobes and upper left lobe of lung. Death sudden. Thrombosis of right heart.

15. *Umbilical Hernia and Talma Operation for Cirrhosis of Liver.*—This patient experienced all the typical symptoms of pulmonary embolism with sudden death as did those whose records succeed this one except two to be mentioned later. He was operated upon for a large umbilical hernia and at the same time the Talma operation for cirrhosis of the liver was performed. Eleven days after the operation he suddenly became breathless, cyanosed, and in ten minutes was dead. No autopsy could be obtained in this or the succeeding cases, hence they are submitted not as proven instances of pulmonary embolism but as suggestive cases in surgical practice in which a better explanation for death cannot be given.

16. *Hysterectomy for Carcinoma.*—A lady fifty-six years of age was operated upon by the Wertheim method for cancer of the uterus. No unusual features marked her convalescence. She was up on time and when preparing to go home four weeks after the proceedure, suddenly dropped to the floor while crossing the room, gasped for breath and was dead in thirty minutes.

17. *Resection of Stomach for Carcinoma.*—A man sixty-eight years of age suffering from cancer of the stomach underwent a resection without shock or subsequent ill effects for three days. He was sitting up in bed talking to his nurse, having taken liquid nourishment and being entirely without abdominal symptoms, when suddenly he became unable to get his breath, as the nurse related, dropped back deeply cyanosed and died a few minutes later.

18. *Hysterectomy for Carcinoma.*—Another Wertheim operation for cancer of the uterus done on a lady forty-four years of age resulted in sudden death in very much the same way. Ten days after the operation she was sitting up in bed having just partaken of a light lunch, when suddenly she began to breathe with great difficulty, extremities became cold, every evidence of extreme shock appeared and in eleven hours she was dead.

19. *Umbilical Hernia.*—An operation for umbilical hernia on a lady fifty-two years of age was attended by a somewhat similar set of symptoms but resulted favorably. Eight days after the

Mayo overlapping operation there was a sudden onset of the manifestations just related. However, under stimulating treatment she gradually began to breathe more easily and in twenty-four hours was considered out of immediate danger. She gradually improved, left the hospital a month later and has remained well ever since.

20. *Appendectomy.*—A man thirty-eight years of age was operated upon for appendicitis in the interval. The procedure was very difficult and consisted of the removal of a stiff, tightly adherent appendix. His recovery was devoid of any untoward incident up to the ninth day, when being allowed to get up for the first time he suddenly became intensely cyanotic, breathless, unconscious and died in a very few minutes.

21. *Intestinal Resection* with Murphy button anastomosis was done on a man fifty-four years of age and two days later, while he was normal, apparently comfortable and conversing with one of us, he suddenly gasped for breath, became blue, unconscious and was dead within five minutes. This case was clearly one of some form of suffocation. However, there was no obstruction in the air-passage, since a knife that happened to be handy was plunged into his trachea and one lung inflated through catheter, hence this suffocation can only be regarded as due to the sudden interruption of the oxygen carrying blood stream.

22. *Varicose Veins of Leg.*—A lady forty-seven years of age was operated upon for varicose veins on the lower leg. A combined Mayo-Schede operation was performed. The same evening she became suddenly cyanotic, complained of shortness of breath, pain and compression in the chest; intense anxiety was present; extremities became cold, but the symptoms rather rapidly disappeared and as yet no further danger of this kind has been encountered. She is, however, in the hospital at the time of writing.

It may be of value in the sixteen surgical cases to note the interval of time that elapsed after operation or injury before the onset of pulmonary symptoms. In two of these this feature is not noted in the records, hence but fourteen are left for our consideration. In these cases this period was as follows:

One, one day; one, two days; one, three days; one, six

days; four, eight days; two, nine days; one, eleven days; one, thirteen days; one, fifteen days; one, twenty-eight days.

An average shows that a little less than seven days intervened as a rule between the time of operation or injury and the lodgment of the blood clot in the pulmonary artery. It should be noted that in those cases where embolism occurred a few days after operation that the condition was such that thrombosis may have been present some time before operation.

Twenty of the twenty-two cases cited resulted fatally. In this connection it is interesting to note the time intervening between the onset of symptoms and the occurrence of death. These are given as found in the hospital records:

Three, suddenly or instantly; one, almost instantly; one, few minutes; three, five minutes; two, ten minutes; one, fifteen minutes; four, thirty minutes; one, two hours; one, five hours; one, eleven hours; two, twelve hours.

As far as the symptoms of thrombosis preceding pulmonary embolism are concerned, Lotheisen has very properly remarked that they very often fail entirely. However, Schachtler has made some very interesting observations which may be of value in this connection. He had the opportunity of studying seven cases at Zurich and noted that the temperature remained normal in all of them while the pulse gradually rose in a step-like (*staffelfoermig*) manner, until the lung symptoms became manifest. He regards this change in the pulse as indicative of thrombus formation.

The symptoms of pulmonary embolism cannot fail to be burned into the memory of one who has ever seen a patient die as a result of this accident. The seemingly normal individual suddenly becomes breathless, cyanotic, anxious, restless, complains of pain and oppression in the chest, the pupils grow wide, cold sweat pours and unconsciousness quickly supervenes. The pulse in many instances becomes rapid and irregular to the point where it cannot be counted at all. In one case which we have mentioned we had apparent complete blocking of the main trunk where symptoms of complete suffocation suddenly appeared, the pulse, as might be expected when air is instantly

cut off, became slower and less compressible. The symptoms in general are analogous to those which are seen when one of the main branches of the pulmonary artery is ligated in a dog. The rapid over-distention of the right ventricle which ensues is accompanied by a lowering of arterial blood pressure and a tremendous rise of venous pressure. Whether cyanosis, dyspnœa and failing pulse are referable to asphyxia or cerebral anæmia or interference with the coronary circulation or to all three together is, according to Welch, neither easy nor important to determine.

Unfortunately the treatment of such conditions must be largely of a preventive nature. A very strong heart may tide over an individual in whom only one branch of the artery is occluded and consequently the opinion is general that every heart should be aided as much as possible by stimulation. However, not much is to be expected in most instances. In order to prevent just such accidents, Mueller cites cases in which he ligated quite a number of varicose veins in the lower extremity, while Kramer split varicose saphenous veins in fifty instances and evacuated thrombi to prevent pulmonary embolism, as well as the local effects of the disease. He was successful in every instance. Becker advises the removal of the saphenous vein when the thrombus has not extended into the femoral vein. It has recently been suggested that the pulmonary artery may be opened and the embolus removed.

Our own suggestion prompted by more than one of the cases above recorded relates to varicose veins in the vicinity of abdominal tumors. Not infrequently are these seen in the female pelvis, especially in connection with myomata of the uterus. They should if possible be extirpated with the growth, or at least ligated as far out as possible toward the pelvis wall, to avoid the likelihood of thrombosis (if they are left behind) with a subsequent fatal accident of the most distressing nature.

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PRIMARY CARCINOMA OF THE HEPATIC DUCTS.

THE REPORT OF A CASE WITH THE AUTOPSY.

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THIS case is recorded because of the unusual origin and location of a primary carcinoma of the biliary passages—exactly at the termination of the larger hepatic ducts.

This case is of interest clinically because it illustrates an exception to Courvoisier's law. No palpable gall-bladder existed previous to death. At autopsy no over-distended gall-bladder and no gall-stones were found. The woman died after an exploratory incision probably from shock contributed to, somewhat, by the slight oozing of blood found at the autopsy. There were no signs of active hemorrhage previous to death.

M. M., a woman 55 years old, married. M. G. H. record No. 151915.

Previous History.—She had had grippe seven years ago, malaria with chills upon several occasions and during the past fifteen years chronic gastritis. The catamenial period ceased three years ago. Two months ago the skin was slightly yellow. Ten days ago there was rather a sudden decided jaundice. The urine showed evidences of bile. The patient has lost ten pounds in weight during the last two months. She was quite thin. The skin and conjunctiva were deeply jaundiced. The liver could just be felt beneath the right costal border.

With this brief history and physical examination it was thought the woman had a malignant growth in the liver, in the neighborhood of the larger hepatic ducts, although a stone in the common duct was considered a remote possibility, even though there had been no attacks of pain at any time.

FIG. 1.

Primary adenocarcinoma of the hepatic ducts. Note the location of the new growth in the liver section: H, hepatic duct; Cy, cystic duct; Co, common duct: A, gall-bladder; B, tumor. (Photographed by Mr. Brown, Pathological Laboratory, M. G. H.)

The abdomen was opened and a tumor felt at the termination of the hepatic ducts. The abdomen was closed carefully by layer sutures. The woman died two days later. The report of the autopsy follows.

Autopsy made and reported by Dr. Oscar Richardson, March 18, 1907, 6 hours postmortem.

Anatomical Diagnosis.—Adenocarcinoma of the Hepatic Bile Duct with Occlusion. Icterus. Operation Wound. Hemorrhage into the Peritoneal Cavity. Arteriosclerosis of the Aorta.

A woman, 55 years of age, 150.5 cm. long, well developed and fairly nourished. The tissues of the marginal wall of the wound show considerable infiltration with blood. The peritoneal cavity contains a slight amount of free blood and a larger amount of frank clotted blood. This clotted blood is mainly situated about the liver and flattened masses of it rest between the liver and diaphragm, completely covering over the surface of the liver. The omentum, in the region of the liver, shows considerable infiltration with blood and on the under surface of the liver nearby there are several small thick masses of clotted blood measuring 3 or 4 cm. in greatest dimension. The anterior margin of the right lobe of the liver is at about the costal border in the right mammillary line. The stomach and intestines on section present no lesions.

Liver.—Weighs 1275 Gm. On section the tissue is firm and shows generally marked green mottling. No stones in the gall-bladder. The common bile duct and the hepatic duct outside of the liver are free and not remarkable, except that there is a very slight amount of soft, rather foul, semi-fluid material in the common bile duct. At the point of entrance of the hepatic duct into the liver the lumen of the duct does not allow the passage of the smallest probe.

Dissection of the liver shows in the region mentioned a firm gray-white mass of new growth-like tissue fairly well marked out from the surrounding liver tissue and measuring about 3.5 cm. in each dimension. The tissue of this new growth-like mass is apparently continuous with the tissue of the wall of the hepatic duct where it is lost in the mass by which the duct is occluded. On the anterior surface of the left lobe of the liver near its margin there is a small grayish area which on section is seen to be the outer surface of a small, firm, gray-white mass of new growth-like tissue fairly well marked out from the surrounding liver tissue (Fig. 1.).

In the lesser omentum posterior to the posterior wall of the duct, at the junction of the hepatic and cystic ducts, there is a very small, rather firm, gland-like mass of tissue. On section it is not remarkable. No tissue of new growth is found in any of the tissues of the body other than in the hepatic bile duct and the liver.

Microscopical Examination.—Sections of the tumor show typical adenocarcinoma in which the stroma is not excessive in amount. The tubules are generally formed by rather low epithelium and contain considerable mucin-like material.

THE OPERATIVE TREATMENT OF INTRACTABLE VOMITING, NOT DUE TO PYLORIC OBSTRUCTION—NEUROSIS OF THE STOMACH.*

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AMONG the benign diseases of the stomach, in which surgical aid may have to be invoked to effect a cure, is one that seems to me of sufficient interest to be assigned a special chapter in the group of borderland cases, namely, the intractable, irregular vomiting, not due to pyloric obstruction, the so-called neurosis of the stomach. It consists in frequent attacks of extreme gastric pain, and irregular vomiting, sooner or later after the partaking of food. Most careful analyses of the stomach contents fail to reveal any disease, except, perhaps, now and then some hyperacidity. On abdominal section a thorough search of the entire accessible part of the stomach and duodenum, anteriorly as well as posteriorly, fails to reveal the slightest abnormality.

The disease is found in women; more frequently unmarried ones.

We are in the habit of calling such a complex of symptoms "neurosis of the stomach," a disease which, surely, forms a clinical entity. But, inasmuch as I have failed to find the latter point brought out in any of our surgical text-books, I thought it might not be amiss to discuss the subject from the standpoint of a real ailment, that is entitled to all consideration, the same as any other such recognized disease.

Neurosis of joints, especially of the knee and hip, also principally, if not exclusively, seen in the female sex, is a well-known trouble, although it is often not recognized by the family physician. A number of such cases that had been

* Read at a meeting of the New York Surgical Society, Feb. 12, 1908.

incorrectly diagnosed have come under my personal observation in the course of the years. Yet, the history of such cases plus thorough examination ought to promptly show the exaggeration of the symptoms on the part of the patient, as well as the perfect health of the respective joint. Firm and encouraging talk, without betraying the true condition of affairs to the patient, and immediate, insistent treatment, will quickly cure the patient who may have been bedridden for months and may have disturbed and alarmed her surroundings by her frequent intolerable shrieking. The patient is asked to get up at once, the consultant insisting upon her ability to do so. He then may offer her his arm for support and makes her walk, if possible at once up and down the stairs. She soon recognizes that he is right, that she can do as he suggested. This, with some additional general advice, will speedily effect a permanent cure.

However, with the stomach, this is different. Here we are unable to demonstrate anything; all that could possibly be advised, has already been tried by the internal physician. An assurance that the trouble will pass over will almost invariably end in failure; in fact, will only make things worse. Surgical work alone, *i.e.*, an operation consisting in opening the abdomen can, and usually does effect a cure.

Such an operation will, of course, reveal some adhesion or kinking of some kind, which was responsible for the symptoms. With the assurance of the correction of the abnormality, relief sets in and a permanent cure usually results.

A brief description of a few cases that have come under my own observation within the last five years, will illustrate the peculiarities of the trouble and its simple surgical treatment.

Case I.—Female, 22 years of age; father died of cancer of the stomach. Patient suffered from frequent attacks of gastric pains and irregular vomiting after meals; some blood, but not characteristic; no appetite, material loss of weight. Ulcer treatment, with protracted rectal alimentation faithfully carried out; vomiting continues. Acidity rather reduced; marked tenderness

in epigastric region. Probable diagnosis: Ulcer, exceptionally with low acidity.

As the six months' almost uninterrupted, most careful treatment had failed to improve the condition, and the patient continued to lose, but had to return to work, operation is decided upon, and done in December, 1903. Thorough examination of the stomach, both anteriorly and posteriorly, by inspection as well as palpation, fails to reveal the slightest pathologic change; there is no adhesion, no infiltration, no scar formation, in short, the condition found on operation is absolutely normal, clinically. The abdomen is closed. The patient is told that the expected ulcer was found and attended to, with the result that the vomiting promptly stopped. She soon resumed her work and has been well ever since, with the exception of some hyperacidity which has recently been noticed.

This case made a lasting impression upon my mind. We all had expected to find at least some ulceration or its sequelæ, and yet nothing could be found. We, therefore, could not possibly explain the phenomenal result in any other way, than by assuming that we had had to deal with a neurosis, although the patient was a very sensible young lady who was thoroughly wrapped up in her work. I recognized that this disease represents a typical, clinical picture and decided not to refuse any operation in similar cases, but, on the contrary, to rather encourage it, provided the possibilities of internal treatment have been exhausted. This, of course, would mean widening the indication for surgical work in these benign borderland cases.

It was almost three years before a similar case came under my care.

Case II.—A young lady of 23, engaged to be married, who had had rheumatism when three years of age. She suffered from persistent slight mitral insufficiency, frequent headaches, hyperacidity, frequent irregular vomiting after meals, which was now and then tinged with blood. A most careful regime, especially as regards diet, was ordered by her physician, in consequence of which she naturally lost some weight; now and then she had

" fainting spells." The gastric pains complained of did not occur during or immediately after eating, but often one-half hour following the ingestion of food, making the diagnosis of ulcer rather doubtful. All symptoms increased in spite of a prolonged stay in the country, and the patient was brought to the hospital, ready to have anything done that promised relief. She declared she " would rather die, than continue to live in that wretched condition," and insisted upon an operation, refusing to wait for the return from the country of the originally consulted surgeon. So the case came under my care. Reluctantly I agreed to perform the operation in view of the diagnosis of neurosis, that had been made. Yet, mindful of the splendid result of abdominal section in my former case, I consented.

Operation showed not the slightest pathologic change on most careful search of the organ as far as it could be reached with the eyes and hands. Hence, the abdomen was closed and the patient told that an adhesion near the pylorus which evidently had been the cause of all her trouble, had been severed and that she was now bound to get well. From the day of the operation improvement set in. However, on the tenth day after operation an old medical friend of hers visited her and, not having been warned, said to her in a jocose manner: " Well, well, you are a nice girl, to suffer so much, and then nothing is found at the operation." Right after his departure the old trouble recurred, pain, vomiting, etc., set in again. When I called, having been informed of what had happened before entering her room, I addressed her most seriously, saying that the doctor was mistaken, not having been present at the operation, and that I could but repeat the correctness of my former statement. My assurance had the desired effect; improvement again set in and she soon left the hospital in perfect health, got married and has been well ever since.

Case III.—Female, 22 years old; school teacher: frequent attacks of pain in pit of stomach since two years, usually increased after meals, also nausea and vomiting; oppressive feeling when lying on back; two weeks ago some blood appeared in vomitus; heart, lungs and kidney normal; no movable kidney. Three years ago, appendix was removed by another surgeon, without improving condition; organ was found little changed, some slight adhesions only being encountered. Of late slight rise of tempera-

ture at night. Careful analysis of stomach contents showed reduced acidity; leucocytes 33,600; polynuclear 84 per cent. Inflammatory condition suspected; perhaps cholecystitis. Operation April 19, 1907. Nothing abnormal was found. Yet the effect of the operation was simply magical: bowels soon moved regularly; appetite became good and food was retained; the oppressive subjective feeling as well as the tenderness in the pit of the stomach disappeared. Diagnosis: neurosis.

Inquiry shows that patient has remained cured of her old trouble, but, being a neurasthenic, she has since developed some spinal symptoms.

CASE IV.—Female, 28 years of age; has suffered periodically for the last two or three years of gastric pain and vomiting; claims to have vomited a quart of blood several weeks ago, necessitating confinement to bed, and rectal alimentation. Careful diet since; pains continue, setting in shortly after the ingestion of food and lasting two to three hours, when vomiting relieves the same. Examination shows the epigastric region very tender to the touch; stomach enlarged; chemical examination negative; motor function unimpaired; slight hyperchlorhydria. Administration of large amounts of bismuth brings no relief. Vomiting and pains continue unremittingly. Careful ulcer treatment for over a month, at the hospital, when another hæmatemesis set in, the blood being intimately mixed with the food. Again rectal alimentation. As soon as feeding by mouth was resumed, blood again was vomited. Considerable loss in weight. Diagnosis: Ulcer of stomach, without pyloric stenosis. Operation advised and done by me about a year ago. Finding absolutely negative, as far as direct examination could be carried. In view of the possibility of the presence of an ulcer further down in the duodenum, gastro-enterostomy (with short loop and suture) was done. This, however, only tended to aggravate the trouble; vomiting and pain continued, blood often being admixed with the fluid returned. The patient continued to lose ground, in spite of frequent hypodermocylses, rectal alimentation, etc. Evidently, the artificial anastomosis had made matters worse. When it became evident that it would be advisable to destroy the same and restore former anatomical relations, it was too late; the patient was too weak to stand another surgical intervention, and died six weeks after the operation. Unfortunately, a post-

mortem was not permitted, even wound inspection was denied. The suggestion was made that the bleeding might have been caused by varicose veins in the neighborhood of the cardia.

Of course, this case does not really fit into the frame of the clinical picture under discussion. Nevertheless, I thought it advisable to put it in, as the symptoms shown were very similar to those observed in the other cases, only more aggravated.

I feel positive that the patient would have had a far better chance of recovery, had I closed the abdomen after the negative finding of local inspection and manual examination.

Dr. W. F. Mayo, of Rochester Minn., and Dr. George E. Brewer, of New York, have reported similar cases, in which gastro-enterostomy failed to bring relief or made matters worse.

CASE V.—Female, aged 20 years; well until about four years ago, when vomiting set in shortly after meals. Patient has seen many physicians; also went to hospital where stomach contents were carefully analyzed with negative result as to pathologic changes and operation was proposed, but not accepted. Vomiting continued; never admixed with blood; pains especially severe at time of menstruation, always more pronounced on right side. These symptoms continued for a whole year, when improvement set in and the patient was well for two years, after which period the rebellious stomach condition returned, though it was limited to the time of menstruation. For the last eight months the pains in the right side, too, have returned and with it the vomiting and gastric pain, the latter evidently not dependent upon the ingestion of food, certainly not increased after meals. Vomiting occurs irregularly, from five minutes to two hours after eating. No movable kidney. Greatest tenderness in appendix region; somewhat less in epigastrium, but the entire abdomen is more or less tender. The patient distinctly gives the impression of an hysterical girl. In view of the fact that a brother had recently died after an operation for appendicitis at one of our public hospitals, the patient was worried principally by the thought of having the same disease which, certainly, could not be absolutely excluded.

Therefore, removal of the appendix was advised, with the idea (though not expressed) of testing the result of the operation upon the stomach trouble, should the appendix be found not to have been the cause of her symptoms. Thus, in October, 1907, appendectomy was done. The organ was slightly thickened and adherent but, from a surgical point of view, not sufficiently diseased to account for symptoms. Nevertheless, immediate improvement set in, the patient was able to freely partake of unselected food without ill after-effects, pains ceased, when suddenly, about four weeks later, without any known reason, all former symptoms returned, but in milder degree. She called in her family physician who prescribed and then sent her to me. I endorsed the doctor's prescriptions, spoke to her hopefully, weighing my words most carefully. Still, it seems I did not encourage her sufficiently. For, as the mother told me, immediately after her return from my office, all symptoms got worse and she fell back into her former state. Being convinced that the diagnosis of neurosis was correct and, unwilling to repeat a long-continued local lavage treatment as previously employed by another colleague, without result, I insisted upon abdominal section which was done five weeks after the first operation. It showed the stomach absolutely normal; no infiltration, no adhesions of any kind, in fact, it presented not the slightest clew for any of the symptoms observed. Nevertheless, improvement was prompt and the patient has remained in this good condition up to the present time.

Of course, in view of the impossibility of furnishing proof for the assertion, it is difficult to maintain that the disease in question is entirely of nervous origin. It might be claimed that a single (or multiple) superficial mucous ulcer—though not found—may yet have been the cause of the clinical signs. However, personally, I am absolutely convinced that the symptoms complained of were not dependent upon a pathologic change, with the possible exception of Case IV, which, as will be remembered, was rather doubtful.

It cannot be gainsaid that the cause of the prompt improvement following abdominal section in these cases is somewhat obscure; most probably it is of mental character, the patient's mind being set at ease by the attending surgeon's

confident assurance that now, the cause of all her trouble having been found, everything *must* be all right. Still, it may be that the handling and stretching of the gastric walls, or the entrance of air into the abdomen exerts a curative influence. Be this as it may, the principal factor in the cure of these cases is surely the operation *per se*.

My main purpose in writing these lines is *first,* to recall to the mind of the general practitioner, the fact that cases like those described, clearly belong to the borderland, and that, after he has exhausted all means at his disposal, a mere abdominal incision which, as a matter of course, *will reveal* some kinking or adhesions, is apt to permanently cure the patient; *second,* to impress upon the surgeon, that it is unwise to refuse operation; *third,* that gastro-enterostomy in these cases is clearly contraindicated, in fact, may result fatally. It is indicated only in cases of pyloric stenosis and for the purpose of putting at rest recurrent gastric ulcers that may have developed in the distal part of the stomach.

THE VALUE OF ENTEROSTOMY AND CONSERVATIVE OPERATIVE METHODS IN THE SURGICAL TREATMENT OF ACUTE INTESTINAL OBSTRUCTION,

WITH REMARKS ON THE IMPORTANCE OF OPERATIONS IN TWO STAGES.*

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In spite of the advances that have been made in methods and technic, the mortality after operative interference in acute intestinal obstruction is still a very high one. In the hands of different operators the mortality has varied between fifty and seventy per cent. Of 100 cases treated by operation, during 1906, in three large hospitals of this city, 54 per cent. died. Ranzi has recently collected 758 cases from literature, with a mortality of 57 per cent.[1] Other reports give a still higher death rate.

The majority of the patients present,—when seen by the surgeon,—advanced symptoms of obstruction; relatively few come to operation early when the manipulations necessary for the finding and relief of the obstruction are well borne.[2] This is due in many cases to the difficulties in making an early diagnosis, sometimes to delay on the part of the patient, sometimes to the very rapid progress of the symptoms.

Even if the very advanced cases—those in extremis—are excluded, the mortality after operations for acute intestinal obstruction will still be found to be a very high one—30 to 40 per cent. From the medical standpoint, this mortality can be diminished only by improvements in diagnostic methods, so that the patients can be referred to the surgeon more early; from

* Read before the N. Y. Surgical Society, January 22, 1908.

[1] Among these cases were included strangulated hernia, acute pancreatitis, etc.

[2] In only about 10 to 15 per cent. of the cases admitted into Mt. Sinai Hospital is the patient's condition still to be called a good one.

the operative standpoint, the number of operative failures can only be decreased by greater simplicity in operative manipulations.

In a relatively small number of patients, the general condition is still a very good one, so that radical operative interference is fully justified. In the desperate cases all that can be done to relieve the urgent symptoms is to open and drain the bowel. There are a large number of cases, however, which, in point of severity, may be placed midway between those in desperate and those in good condition. These are usually subjected to radical operative interference. During the past two years, the writer has operated upon a number of such patients by performing an enterostomy of the most distended coil of intestine which presented when the abdomen was opened. No search was made for the cause of the obstruction nor was any effort made for its relief—unless the obstruction was at once met with and the freeing of the bowel a very simple matter. The cases herewith reported will show that the results were very satisfactory ones.

The operative indications in acute obstruction of the bowels are two-fold, the relief of the obstruction, and the withdrawal from the body, as rapidly as possible, of the retained and poisonous intestinal contents. It is now recognized that the presence of the retained intestinal contents is a very great, if not the most important factor in the production of grave symptoms. Powerful poisons are produced by the changes which the intestinal materials undergo, poisons which have a baneful influence not only directly upon the intestinal muscle, but also—as they are absorbed—upon the nervous system and upon the cardiac muscle (Albeck, Clairmont and Ranzi, Kukula, Nesbitt, etc.). The sudden strangulation of a loop of gut—under a band, for example—may cause considerable abdominal shock, but how much more grave is the increasing shock from the virulent poisons formed in the obstructed bowel! The distention of the intestine with gas adds its deleterious effect, not only by pressing upward against the diaphragm, interfering with respiration and the

heart's action, but also by disturbing the circulation of blood in the bowel wall. This is in turn (Kader) followed by a formation of more gases and by increased distention. In most cases of acute intestinal obstruction, therefore, the gravity of the symptoms is due to those conditions which follow the obstruction rather than to the obstruction itself.

When the significance of the poisoning from the retained intestinal contents began to be recognized, and attention was turned to the question of their rapid elimination, it was thought that the best way to rid the body of these substances was by increasing peristalsis after the obstruction had been relieved [enemata, cathartics, injection of magnesium sulphate into the bowel (McCosh), etc.]. In many patients the operation for the obstruction was well borne, but death occurred after a few hours. Clearly, in not a few patients, this was due to the rapid absorption of the toxic substances by the healthy gut below the obstruction. Most operators then made it a rule,—either before or after the search for and relief of the obstruction,—to empty the distended loops of intestine of their gaseous and fluid contents by aspiration or incision followed by suture (McCosh, Mikulicz, Lennander, Dahlgren, and many others). This is the procedure most in vogue to-day. Another plan and one that has contributed much to diminishing the operative mortality, is to drain the intestine above the site of the obstruction at the same operation at which the obstruction is relieved. It would always be preferable to do the enterostomy first, if it were not that such a drained loop is often in the way in the search for the obstruction. Besides, there is the danger that the tube in the bowel may be disturbed during the manipulations, and a soiling of the peritoneal cavity occur. Therefore, one is apt to delay the opening of the bowel until after the obstruction has been relieved, or to close the opening before looking for the obstruction.

It is pertinent, therefore, to inquire whether,—in all patients, whose strength is at all diminished by the shock of the obstruction and the poisoning from the toxic materials

in the intestine,—better results would not be obtained if the surgeon always chose the simplest method for the relief of the intestinal retention. In other words, if the simple operation of opening and drainage of the bowel were done more often, we would more rarely see collapse during or at the conclusion of our operative manipulations in patients who had, at first, seemed to have sufficient strength to withstand the shock of the operation.

Simple enterostomy and drainage was once highly recommended. Treves advises against its use in all but exceptional cases. He calls it "a rough and ready operation, extreme, irrational, and blindly advised," and declares that such evidence as we possess is in favor of the operation only in "extreme cases in which the patient can only be submitted to a procedure of the slightest magnitude." He believes that not a few of the cases of recovery from intestinal obstruction that have been reported have been the subjects of erroneous diagnosis. He speaks very highly, however, of the establishment of an opening in the bowel after the obstruction has been found and relieved, and declares that this addition to the operation has reduced the mortality of the measure by fifty per cent.

For the reasons I have above stated, the objection of Treves, that one shall not blindly do an enterostomy for the relief of acute obstruction in any but desperate cases, seems to me too far-reaching.

It is hardly necessary to state that the operation of enterostomy is a very simple one; if necessary it can be done in a few minutes under local anæsthesia. It may be a life saving procedure in very desperate cases, of which the following was an example:

CASE I.—*Acute intestinal obstruction following upon a chronic obstruction; enterostomy and drainage under local anæsthesia; ileosigmoidostomy; resection of intestine and end to end anastomosis for persistent fecal fistula; recovery.*

Robert L., 45 years of age; seen with Dr. S. Basch; admitted March 7th, discharged cured May 13th, 1907. Ten years before the patient had an attack of abdominal cramps without vomiting, lasting seven days. Fifteen weeks before admission, he noticed that he had become gradually more and more constipated. About this time he had an attack of constipation with abdominal pain and nausea which lasted three days and was relieved by free catharsis. From that time until he was admitted to the hospital he had had, every few days, a similar attack, each time relieved by cathartics and enemata. He vomited during the most recent attacks. Never passed blood; never had fever; has lost 40 pounds in weight. Twenty-four hours before, he was suddenly attacked by severe cramps with vomiting, at first of food and then of feculent material; there was absolute constipation in spite of enemata and cathartics; for six hours he had vomited every few minutes, and was much exhausted.

The patient's condition, on admission, was a very poor one; his eyes were sunken and face pinched; his pulse was barely perceptible; extremities cold and clammy; he was vomiting almost continuously small amounts of intestinal contents. The abdomen was enormously distended and small intestine peristalsis was everywhere visible; on account of the enormous distention, and marked general tenderness, nothing definite could be found on palpation. Rectal examination negative. Although the condition seemed to be a hopeless one, he was nevertheless taken to the operating room.

Under Schleich anæsthesia the abdomen was opened through the fibres of the right rectus muscle (Dr. Elsberg). The intestines were much distended and of a dark blue color. One loop was pulled forward, a small opening made into it and drainage tube inserted and fixed into place by several tobacco-pouch sutures. A very large amount of fecal matter and much gas was expelled. Several other loops were incised and their contents evacuated and the openings closed by suture. The abdominal walls were closed around the tube by interrupted sutures. After the operation, which had lasted less than 15 minutes, the patient's condition improved somewhat; there was a profuse discharge of fecal matter through the tube. Twelve hours after operation the patient was much better, the pulse had become slower and of better quality; the abdomen was now soft and collapsed; the patient

had not vomited since the operation. Thereafter he made a good recovery.

Three weeks after the first operation, the abdomen was opened through the left rectus muscle and the attempt made to find the obstruction. There was a very dense mass of adhesions between the cæcum and lower coils of ileum which it was impossible to separate. An ileosigmoidostomy was then done in the usual way by suture, thus excluding the affected portion of intestine. Recovery from this operation was rapid and uneventful, and the patient began to gain flesh rapidly. The enterostomy opening could not, however, be made to close. On April 22nd the loop of small gut containing the opening was exposed and resected,—an end to end anastomosis by suture being made. Recovery from the third operation was also uneventful. The patient could be discharged cured with all of his wounds healed, free from all symptoms, and having gained more than thirty pounds, on May 13th, nine weeks after the first operation.

This patient was in a very desperate condition when admitted to the hospital. By the simple operation of enterostomy, it was possible to tide him over the acute symptoms and thus to save his life. At the second operation, when the patient was in good condition and there was no need of great haste, the adhesions around the obstructed bowel were found to be so dense that it was impossible to divide them. An ileosigmoidostomy had to be done. The patient had probably had an attack of appendicitis many years before; a search was made for the appendix at the second operation, but it could not be found.

In these desperate cases, no voice is raised against the operation of enterostomy. But in less grave cases, in patients who still seem to be in fair condition, whose circulation is still pretty good, who are not exhausted by the vomiting, the operation of opening and drainage of the bowel (without a search for the obstruction, except in the simplest cases) has few adherents. It is just in this class of cases that I believe that enterostomy should be done more often and the search for and relief of the obstruction left to a second sitting. This

is no more of an "extreme, irrational, and blindly advised" operation, than is the opening and drainage of the bladder as a preliminary to the removal of the prostate for urinary obstruction. Improved results in the operations for acute intestinal obstruction will be sure to follow an increased frequency of operations in "two stages."

Against the operation of enterostomy alone, a number of other arguments have been advanced.

1. The cause of the obstruction remains unrelieved.

2. There may be a gangrenous process present, or gangrene may set in unless the obstruction is relieved.

3. After the enterostomy, a fecal fistula will remain which may require a second operation for its closure.

As to 1—

It is true that if nothing is done but the enterostomy, the obstruction remains unrelieved, and further operative interference will in all probability be required. The dangers of an operation for obstruction when there are no acute symptoms are, however, so much less, and the technical difficulties so much smaller, that the division of the operation into two stages is justifiable.

In the presence of acute symptoms, the operation must usually be done hurriedly. As soon as the abdomen is opened, a large mass of distended intestines present. The shock from handling the bowel is a very great one. Even with the gentlest manipulations, the peritoneal covering of the bowel is apt to tear.

Very often there is no hope of finding the obstruction, unless more or less of the bowel is drawn out of the abdomen. This evisceration causes enormous shock, and the replacement of the intestines is often very difficult, even if a number of coils have been emptied by aspiration or enterostomy. It has been my experience that in the cases of acute obstruction in which it was necessary to drain the bowel as well as to relieve the obstruction, the mortality has been a very high one.

In some cases the drainage of the bowel will relieve not only the acute obstruction symptoms but also the obstruction.

Thus in obstruction by bands—especially if they are of recent origin—the emptying of the distended intestine may allow the obstructed loop to slip out from under the band. Or the recent adhesion will gradually stretch while the bowel is being drained. In the same way, drainage of the distended bowel above the obstruction may allow the volvulus to untwist, the kink to straighten out, etc. In the following cases of post-operative intestinal obstruction, the opening and drainage of the bowel not only relieved the acute symptoms but was curative.

CASE II.—*Acute gangrenous appendicitis, seropurulent peritonitis; appendicectomy and drainage; post-operative intestinal obstruction due to adhesions; enterostomy and drainage; recovery.*

Mildred L., 9 years of age; seen with Dr. M. Bodenheimer; was admitted and operated upon for acute appendicitis with seropurulent peritonitis on August 14th, 1907. The patient made a rapid convalescence from the disease, the temperature was normal from the fourth day after operation. On the tenth day, the patient vomited and complained of abdominal pain, without temperature rise or other symptoms. The bowels, which up to that time had moved regularly, refused to move in spite of cathartics and enemata. Vomitus at first consisted of food but soon became feculent, and the patient's general condition became very poor. Eighteen hours from the first appearance of symptoms of obstruction, the abdomen was opened through the left rectus muscle, a loop of distended gut pulled into the wound, a tube inserted and the bowel drained. No attempt was made to find the obstruction on account of the poor condition of the patient. The child recovered rapidly after the operation. For the first few days there was a profuse discharge of fecal matter through the tube. After four days, the tube was clamped for 6 hours at a time; the following day the bowels moved per rectum. Three days later, the drainage-tube was removed; the opening was closed in ten days; the bowels moved regularly. The patient was discharged cured on September 21st and has remained well up to the present time.

CASE III.—*Acute gangrenous appendicitis, abscess; appendicectomy and drainage; post-operative intestinal obstruction; enterostomy and drainage; recovery.*

Lionel S., 11 years of age; July 9th, 1905, appendicectomy and drainage for acute appendicitis with abscess; July 19th, first symptoms of intestinal obstruction; July 20th, enterostomy and drainage through left rectus incision; July 23rd, bowels moved per rectum; July 26th, drainage-tube removed; August 28th, enterostomy wound healed and bowels moving normally. Has remained well.

CASE IV.—*Acute gangrenous appendicitis, purulent peritonitis; appendicectomy and drainage; pneumonia with marked abdominal distention; acute intestinal obstruction; enterostomy and drainage; persistent fecal fistula; enterorrhaphy; recovery.*

Samuel L., appendicectomy and drainage, August 25th, 1907, for gangrenous appendicitis with diffuse purulent peritonitis; patient very septic. Double pneumonia of septic type lasting five days after operation. One week later, acute obstruction; marked distention; vomiting of large quantities of fecal matter; enterostomy and drainage; normal bowel movement on fourth day after operation; tube removed on ninth day; fecal fistula persisted. November 25th, edges of intestine freed and turned in with double row of sutures. Discharged cured December 19th.

The clinical picture, in the three patients, was a typical one of post-operative ileus. All three patients were relieved, not temporarily but permanently, of their obstructive symptoms by drainage of the bowel.

In these very recent cases of post-operative obstruction, it is preferable to open the abdomen a little distance away from the site of the first incision, because the intestines in the neighborhood of the former lesion are usually bound to each other by numerous fresh adhesions, which would require extended manipulations for their division. If the obstruction occurs months or years after the operation, it is advisable to open the abdomen through the original incision, as the probability of finding a single band or adhesion is much greater.

In general, it is advisable to open the abdomen directly over the obstructed bowel, if it is possible to locate the site of the obstruction. By a careful examination, the location of the obstruction can be determined with a fair amount of accuracy

in a large number of cases. One can then follow a methodical plan,—relief of the obstruction if found at once and remedied with ease, otherwise opening and drainage of the most distended loop.

In the following cases this plan was followed. In each patient the incision was made over the suspected area; in every one of the cases, the cause of the obstruction was at once found and relieved, although the operator was prepared to do no more than an enterostomy.

CASE V.—*Acute intestinal obstruction due to a band, two and one-half months after operation for acute appendicitis; laparotomy and division of band; recovery.*

Leo S., 14 years old. Seen with Dr. J. Reinthaler. Was attacked three days before with cramp-like pain in abdomen, abdominal distention, vomiting and constipation. The symptoms became gradually worse and the vomiting more frequent; there was absolute constipation. On admission, the abdomen was distended and rigid; there was some movable dulness in the flanks; marked hyperperistalsis. Operation May 16th, 1906, a few hours after admission (Dr. Elsberg). The abdomen was opened through the old scar; the peritoneal cavity contained clear fluid. Just underneath the abdominal incision was found a band of adhesions constricting two loops of ileum. This was divided between ligatures and the abdomen closed by layer sutures. The patient's bowels moved spontaneously a few hours after operation. Convalescence was uneventful. Discharged cured, May 28th, 1906.

CASE VI.—*Acute ileocolic intussusception; laparotomy and reduction; four weeks later, acute obstruction due to band; laparotomy and division of band. Five weeks later acute obstruction due to band; laparotomy and division of band; recovery.*

Irwin F., six months old; seen with Dr. D. E. Alexander; admitted April 30th, 1906. Three days history of abdominal pain, vomiting, constipation. Abdomen distended, hyperperistalsis; small soft mass in right iliac region. General condition fair. April 30th, laparotomy and reduction of ileocolic intussusception; apex of intussusception reduced with difficulty. Uncomplicated recovery.

Four weeks later the infant suddenly developed symptoms

of acute obstruction of the bowels,—vomiting, constipation, abdominal distention. The bowels refused to move in spite of enemata, and the child's condition became rapidly worse. May 24th, second operation, incision through old cicatrix in median line below umbilicus. The abdomen contained free fluid. The cæcum was at once seen constricted by two bands which ran over it, from the ileum. Division of bands was easily accomplished, and the abdomen was closed. The bowels moved spontaneously twenty-four hours later; thereafter convalescence was uneventful.

Six weeks later the child again developed very severe symptoms of acute obstruction. Eight hours from the beginning of the symptoms, the abdomen was opened a third time, through the old scar. The small intestines were enormously distended. A band was at once found which ran from the cæcum to the lower ileum and caused an obstruction of the ileum. The band was divided, the raw surface covered with peritoneum, and the abdomen closed without drainage. Recovery from the third operation was prompt and uneventful. The bowels moved on the day after operation. The patient was discharged cured on the ninth day after operation, and has remained well since.

CASE VII.—*Acute intestinal obstruction due to a band from adhesions after operation for appendicitis four years before; laparotomy and division of band; recovery.*

Aaron S., 14 years old; seen with Dr. T. I. Jacobus; admitted November 13th, discharged November 22nd, 1906. Operated on in another hospital for acute appendicitis four years before. Three days history of abdominal cramps and vomiting. Bowels have not moved for four days. General condition good; abdomen much distended; free fluid; hyperperistalsis. Operation November 13th (Dr. Elsberg): abdomen opened through old scar. As soon as the peritoneum was incised, a collapsed loop of small intestine was seen fixed to the posterior abdominal wall by a band, with distended bowel beyond it. Division of band; closure of abdomen in usual manner. Convalescence uneventful. Bowels moved twelve hours after operation; vomiting ceased at once. Has remained well.

CASE VIII.—*Acute gangrenous appendicitis; seropurulent peritonitis; appendicectomy and drainage; pelvic abscess; incision and drainage per rectum; acute intestinal obstruction due to band; laparotomy and division of band; recovery.*

Morris G., fourteen, was admitted and operated upon (Dr. Elsberg) March 7th, 1907, for gangrenous appendicitis with abscess and diffuse peritonitis. The appendix was removed and the abscess drained. Two weeks later a pelvic abscess was opened and drained through the rectum. Two weeks after this, when the patient was out of bed, he was suddenly attacked by severe cramps in the left lower abdomen with vomiting. The cramps became more severe and the vomiting more frequent. In the lower abdomen was felt a large distended loop of bowel. No fever or other symptoms. Patient passed neither flatus nor feces for twenty-four hours in spite of high and low enemata. Fourteen hours from the beginning of the symptoms, the abdomen was opened through the fibres of the left rectus muscle over the distended coil of intestine. Part of the ileum was found adherent to the left side of the pelvis by a band which kinked and obstructed the intestine. When the adhesion was divided, gas passed from distended to collapsed gut. The abdomen was closed with drainage. The vomiting ceased at once, an enema given soon after the operation was effectual; convalescence thereafter uneventful. Discharged cured, April 28th, seven weeks after the first operation.

CASE IX.—*Volvulus of sigmoid flexure due to congenital megalocolon; laparotomy and reduction; enterostomy and suture; recovery.*

Annie G., 20 years of age, admitted November 19th, 1907, with a history of no movement of the bowels for five days, vomiting, abdominal distention. The patient declared that she had always been very constipated since childhood, that for the last six months her bowels never moved unless she took a cathartic. On admission, the patient's general condition was a very good one, the abdomen was enormously distended, there was marked hyperperistalsis, a large distended coil of intestine could be seen bulging the lower part of the abdomen.

The abdomen was opened through a median incision below the umbilicus (Dr. Elsberg). At once an enormously distended, hypertrophied sigmoid flexure twisted upon itself for 180° presented in the wound. The loop was withdrawn from the abdomen and untwisted. It was so large that it could not be replaced until it had been emptied of gas and feces by an incision. The incision was closed, the bowel returned into the abdomen and the

abdominal wall closed with drainage. The bowels moved four days later. Convalescence was interrupted by a slight wound infection. She is at the present time almost entirely recovered.

In the five preceding cases, the cause of the obstruction was found and remedied with ease, so that enterostomy was unnecessary. The case of the infant who had an ileocolic intussusception, followed by two attacks of acute obstruction due to bands, is especially noteworthy. In all of these patients, no search had to be made for the cause of the obstruction; it was found at once as soon as the abdomen was opened. Therefore the operation could each time be done rapidly with little handling of the intestine. The conditions were different, however, in the following two patients; in both cases I had planned to do nothing but an enterostomy; in both the discovery of the cause of the obstruction, and its relief were easier than was anticipated. In the one case, the extraction of a gallstone from the ileum was accomplished with ease; in the second case, the division of bands in the hernial sac could be done outside of the abdomen, with little handling of the intestine, and hence with little shock.

CASE X.—*Acute intestinal obstruction due to adhesions in a hernial sac; herniotomy, division of adhesions, reduction of intestines; recovery.*

H. R., male, 55 years of age, admitted November 27th, discharged December 13th, 1907. Reducible hernia for ten years. Four days ago the hernia became irreducible, bowels became obstinately constipated, vomiting became frequent. On admission there was a large irreducible inguinal hernia on the left side. The hernial sac was opened through a four-inch incision (Dr. Elsberg). There was a large mass of small intestine in the hernial sac, several loops of which were bound to each other and to the walls of the sac by several firm adhesions. After these had been divided, the intestines were reduced with ease. The neck of the sac was very large. The peritoneum was then closed by a running suture at the base of the sac. Convalescence was rapid and uneventful. The patient was given a truss; no radical opera-

tion was attempted. The bowels moved twelve hours after operation, and regularly thereafter.

The patient's general condition on admission was a good one, although the vomiting was feculent in character.

CASE XI.—*Acute intestinal obstruction due to gall-stone occluding the upper ileum; enterotomy and extraction of calculus; recovery.*

Mrs. B., 62 years of age; seen with Dr. S. Neuhof; admitted April 28th, discharged June 27th, 1906. Gave a history of frequent attacks of abdominal pain for many years. Never was jaundiced. Four days before admission she suddenly complained of severe abdominal cramps, vomited, and had slight fever. For two days she vomited everything taken into the stomach, but the bowels moved with enemata. Thereafter she passed neither flatus nor feces, the vomiting continued and became more frequent; for the last six hours it was distinctly fecal. The abdomen became distended and everywhere tender. The patient was a very stout lady; her condition was poor; the pulse rapid and weak; she was much prostrated. Every few minutes, a distended rigid coil of intestine was to be felt to the right and above the navel. No tumor palpable; rectal examination negative; no jaundice.

As soon as the patient could be transferred to the hospital, the abdomen was opened by an incision to the right and at the level of the umbilicus, over the distended intestine (Dr. Elsberg). The distended loop was drawn up into the wound in order to open and drain it. At once a tumor was felt in this loop which proved to be a large calculus occluding the bowel. The intestine was incised, the calculus extracted, and the incision closed with a double row of Lembert sutures. The abdomen was rapidly closed with drainage.

The patient was considerably shocked by the operation but recovered after energetic stimulation. The vomiting persisted for 24 hours and then ceased. After a very complicated and slow convalescence the patient was discharged cured on June 27th, 1906.

Even in those cases in which the obstruction can be found and relieved with ease, it is often preferable at the first operation to do nothing more than drain the intestine. Had I done this in the following case, the operation would have taken less time and the unfortunate outcome might have been prevented.

The patient's condition was a poor one, the intussusception lay directly under the abdominal opening, its reduction was accomplished with ease; nevertheless the handling of the bowel must have added much to the existing shock. In the future, in a similar case, I should do nothing more than an enterostomy, no matter how great the temptation to reduce the intussusception.

CASE XII.—*Acute ileocolic intussusception; laparotomy and reduction; death.*

Bella P., 7 months of age, admitted and died March 12th, 1907. Three days history of constipation with vomiting. Vomiting fecal on the day before admission. General condition very poor; pulse hardly perceptible. Abdomen distended; hyperperistalsis; in right lower abdomen doughy mass to be felt. Incision over mass through right rectus fibres. Abdomen filled with clear fluid. Intussusception found at once drawn into wound; reduction easily accomplished. About 12 inches of ileum invaginated. Abdomen rapidly closed. Operation lasted 11 minutes. Condition of patient did not improve, death occurred a few hours after operation.

2. It has been advanced as an argument against the operation of enterostomy in acute obstruction of the bowels, that if the obstruction is not looked for, gangrenous intestine may be left in the abdomen, or unless the constriction is relieved a constricted part of the bowel may become gangrenous. The frequency of gangrene is not, however, as great as is commonly believed. I have carefully studied the records of Mt. Sinai Hospital, of other institutions, and the reports in the literature of the subject.

During the last four years, 54 patients with acute intestinal obstruction were operated upon at Mt. Sinai Hospital. In 7 of these cases, or 13 per cent., gangrenous intestine was found at the operation or autopsy (intussusception, 4 cases; volvulus, 2 cases; Meckel's diverticulum, 1 case). Philipowicz has recently reported 80 cases of ileus, in 16 (20 per cent.) of which gangrenous gut was found at operation (volvulus,

11 cases; intussusception, 1 case; Meckel's diverticulum, 2 cases; bands, 2 cases). There was gangrene in 5 of Ranzi's 35 cases (14 per cent.), (volvulus, 1 case; bands, 2 cases; tumors, 2 cases). If the above figures be added together we have 28 cases of gangrene; 19 or 70 per cent. of these were cases of volvulus or intussusception. Gangrene of the intestine is present therefore only in about 15 per cent. of cases of acute intestinal obstruction, and 70 per cent. of the patients with gangrene have either a volvulus or an intussusception. In these latter cases, the cause of the obstruction is usually found with ease, and the gangrenous intestine can therefore quickly be brought outside of the abdomen to be dealt with at a later operation. Excluding intussusception and volvulus, gangrene occurs in about 5 per cent. of patients with acute obstruction. The risk of leaving behind gangrenous gut by the performance of enterostomy alone is therefore a small one.

There is no doubt that, in many cases, the drainage of the distended gut will have a beneficial effect upon a constricted or obstructed loop of gut, and may prevent a threatened gangrene. If gangrenous gut is found at the operation, it is preferable to bring it outside the wound and anchor it there by a few sutures. At any time after the patient has recovered somewhat from his obstructive symptoms, the gangrenous bowel can be excised.

If this plan had been adopted in the following case, the patient would have stood a better chance of recovery.

CASE XIII.—*Volvulus of intestine due to gangrenous Meckel's diverticulum; excision of diverticulum; enterostomy; death.*

Morris E., aged 20, was admitted to the hospital on February 20, 1906, with a history that for three days he had abdominal pain with vomiting and constipation. The vomiting had not been very frequent but the pain had been constant and increasing. Bowels had not moved since onset of illness. The patient's general condition was fair; the abdomen was distended and rigid; the entire lower part of the abdomen was tender; there was only slight fever; the pulse was of good quality and not rapid. An

enema was given soon after the patient entered the ward, and the bowels moved freely. The pain also became less but the abdominal distention persisted. His condition steadily improved until the fourth day. Then the abdominal pain returned and became very severe, the patient began to vomit again, the bowels refused to move. Within an hour his condition became poor, the vomiting grew more frequent, the pulse became rapid and feeble.

He was taken to the operating-room at once and the abdomen rapidly opened by an incision through the right rectus muscle (Dr. Elsberg). The small intestines were much distended. One distended coil was withdrawn from the abdomen, and immediately beneath it was found a small piece of gangrenous gut, which proved to be a Meckel's diverticulum adherent to a loop of lower ileum in such a way that the latter was twisted upon itself for 360°. The diverticulum was freed from its adhesions and tied off at its base and removed, the loop of gut untwisted, and the abdomen rapidly closed with drainage.

The patient was in very poor condition at the close of the operation and his condition remained poor. Twelve hours later the abdomen was again opened through the former incision, a distended loop of intestine pulled forward, opened and drained in the usual manner. The enterostomy did not, however, prevent the fatal outcome, which occurred about 12 hours later.

There is no doubt in my mind that the correct procedure in this case would have been to have brought the gangrenous diverticulum outside of the abdomen and to have established an enterostomy above it. This could have been done in one-half or one-third of the time and would have entailed much less handling of the intestines.

3. Another objection that has been urged against the opening and drainage of the bowel in all but desperate cases, is that a fecal fistula will remain, which may require a dangerous operation for its closure. If the enterostomy is properly done, a fistula will remain in only a small proportion of the patients. The best method for the performance of an enterostomy is that which embodies the principle of the Kader gastrostomy. Two circular sutures are placed in the wall of

the bowel to be opened; a small incision is then made, a catheter inserted; the catheter fixed in the wall of the bowel by a silk stitch, and the two circular sutures then tied. The inner of the sutures is tied first, the catheter being pushed into the bowel. In this manner a canal lined by serous mem-membrane is formed which will close rapidly as soon as the catheter is withdrawn.

The bowel is then attached to the peritoneum along the margins of the abdominal wound by one or two sutures, and the abdominal wound closed around the tube. If the patient's condition is very poor, the small incision in the abdominal wall can be packed with gauze. The tube from the intestine is led over the side of the patient's bed into a bottle or receptacle. There is no leakage by the side of the tube, the dressings remain clean. When the tube is withdrawn the opening in the bowel closes very rapidly.

If the drainage of the bowel is done in the manner above described, and if the obstruction has been relieved, a fecal fistula will remain in only a small proportion of the patients. A persistent fistula can be closed by a lateral enterorrhaphy. Sometimes, however, an intestinal resection will be required.

There is one danger after enterostomy which merits careful consideration. If the obstruction is located in the jejunum, the opening and drainage of the bowel may result in very rapid starvation. Obstruction of the jejunum forms, however, only a small percentage of the cases and the clinical recognition of these cases is often possible. If the enterostomy has been made high up in the small intestine, the delay before the second operation must be a short one—24 to 48 hours.

The cases above reported, 13 in number, represent all the cases of acute obstruction of the bowels, exclusive of strangulated hernia, that have been operated upon by the writer during the past two years on the Second Surgical Service at Mt. Sinai Hospital, and in private practice. The writer deems the following the best working plan for the operative treatment of acute obstruction of the bowels:

A.—*The patients in good condition*—here a more or less prolonged search for the obstruction is allowable.

B.—*The patients in very poor condition*—opening and drainage of the most distended loop of intestine. The incision in the abdomen should be, if possible, over the site of the obstruction; it should be as small as possible. The bowel should be drained by a catheter, fixed in the bowel according to the method of Kader, and the bowel should be fixed to the parietal peritoneum by one or two stitches.

C.—*The patients in fair condition*—relief of the obstruction if the same be found at once when the abdomen is opened, and if the relief can be accomplished without complicated manipulations. In all other cases, opening and drainage of the bowel, perhaps with fixation of affected loop of intestine in the wound or outside of the abdomen. Relief of the obstruction at a second operation.

Conclusions.

1. Operative interference for acute intestinal obstruction should very often be divided into two stages.

2. Enterostomy and drainage should be the operation of choice, not only in the desperate cases, but also in many patients whose condition is still a fair one.

3. Prolonged search for the obstruction and its relief should, in all patients excepting those in very good condition, be delayed until the acute symptoms have been relieved by the opening and drainage of the bowel.

4. The danger of leaving behind gangrenous intestines is a small one, it is smaller than the danger from prolonged manipulations.

5. When gangrenous intestine is present it is preferable to bring it outside of the abdomen and deal with it later; the obstructive symptoms being meanwhile relieved by enterostomy.

6. Enterostomy, thus done, is not an " extreme, irrational and blindly advised " operation, but one that embodies a dis-

tinct therapeutic principle,—alleviation of acute symptoms as the first step in the relief of a pathological condition.

7. The operation of enterostomy may permanently relieve acute intestinal obstruction.

8. Fecal fistulæ will remain in only a small proportion of the cases in which enterostomy has been done, if the opening and drainage is made according to the Kader principle.

THE NON-ABSORBABLE SUTURE AND LIGATURE.*

BY OSCAR H. ALLIS, M.D.,

OF PHILADELPHIA,

Surgeon to the Presbyterian Hospital.

THERE are few subjects that have occupied the surgical mind more than that of suture material. Animal suture material has the disadvantage that when moist it is difficult to tie, when fine it has little tensile strength, and when coarse it is not suited to fine plastic work. Silk on the contrary is the easier handled when wet, makes all the firmer knots from moisture, possesses adequate strength in its finest sizes for the work for which it may be selected, and when rendered sterile satisfies most of the requisites for suturing material.

In the class of surgery that permits of immediate closure of the initial wound, primary union and return to soundness always gives rise to the question, What becomes of the silk suture or ligature? In amputations bleeding vessels are surrounded by different structures than when operations are performed in serous cavities; yet in both instances the sterile suture or ligature is probably immediately enveloped in exudate which is later organized and becomes a part of the economy. If the suture material is fine, it may never give rise to any irritation; but if large, and of sufficient strength to ligate an ovarian pedicle, the ligature may finally come away.

But in the class of surgery—especially abdominal surgery—in which it is not feasible to close the initial wound, pus cases, or cases where drainage is indicated, the fate of the non-absorbable suture or ligature is not a matter of doubt. The suture about an appendix, the stump of a pedicle, or the peripheral suture in a plastic operation of the intestine, is liable to infection; and healing will be retarded until the suture comes away. It is hard to explain why in so many cases of necrosed appendices the sinus leading to the part will be two, three, four, or more months in closing and

* Read before the Philadelphia Academy of Surgery, February 3, 1908.

finally without any assignable cause will heal, unless it can be explained by the presence of infected ligature that has finally been ejected.

No part of the operation for the removal of the appendix has given rise to more discussion than the treatment of the stump. The usual way of ligating with silk and dropping the bowel back, while it often answers perfectly well in clean cases, is, it seems to me, open to objection in the gangrenous ones. The earlier surgeons in amputations always brought the ends of the ligatures out of the wound, and such it seems to me would be good routine surgery in ligations in infected areas.

In anastomoses of the intestines, whether the Murphy button be used or suture, it is the practice of many surgeons to put a fine running stitch around the serous border of the approximated structures. If such a case could be insured against infection this peripheral suture would do no harm; but if infection is unavoidable and drainage necessitated, then this peripheral suture may become a permanent annoyance and be the cause of an intractable sinus.

In a case of gangrene of the intestine following a neglected umbilical hernia, after resection of about five inches of intestine and approximation with the Murphy button I employed a fine silk peripheral suture.

On the tenth day I was surprised to see a large accumulation of fecal matter at the opening of the wound. My fears that the button had escaped at its point of insertion into the abdominal cavity led me to probe for it, but as the patient presented no untoward symptoms I concluded that the rent in the bowel had been made as the button became detached and that only a small rent had occurred. The fecal discharge continued for only a few days but a sinus remained for several weeks, which I attributed to the infected peripheral suture. I therefore took a piece of wire upon which I had made a hook like a crochet needle and passed it down to the bottom of the sinus, and had the satisfaction of catching a loop in the suture. This I seized with a pair of forceps and after

dividing it upon one side of the forceps drew out a single piece quite two inches long.

Such an experience would lead one to adopt some other means of suturing the border of an approximated bowel than entirely surrounding it, or suggest the propriety of bringing the ends of the suture out of the initial wound.

REPORT OF SATURDAY SURGICAL CLINICS FOR STUDENTS,

HELD AT THE GERMAN HOSPITAL OF PHILADELPHIA, 1906 AND 1907.*

BY JOHN B. DEAVER, M.D.,
OF PHILADELPHIA,
Surgeon-in-Chief.

DURING the 26 clinics there were 193 patients operated upon with a total of 261 operations. Upon 113 of these patients 181 operations were performed.

There were 55 cases of appendicitis, of which 25 were acute. Of the patients with acute appendicitis, there were 18 males and 7 females. The appendix was found acutely diseased and removed in 2 patients operated for other conditions: one a male with inguinal hernia; the other a female with prolapse of the uterus.

Of these 25 cases, 12 had abscess. The average duration of the attack in the non-abscess was 5 days, and in the abscess cases 3.6 days. Six of the non-abscess cases were operated in their first attack, and in 9 of the abscess cases the history of a previous attack was not elicited.

The incision varied according to the pre-operative findings. Of these acute cases, in 9 the McBurney or gridiron incision was made; in 3 the incision was made through, and in 9 at the outer border of the right rectus muscle.

In 4 cases the incision was made above and parallel with the outer third of Poupart's ligament and carried well up into the loin space, making the operation in greater part extraperitoneal. When I can do this operation I much prefer it, as the less intraperitoneal intereference, particularly when infection is present, the better for the patient.

The appendix was subcæcal in 4 cases, to the outer side of the cæcum in 1 case, to the inner side in 4, and in 4 cases

* Read before the Philadelphia Academy of Surgery, February 3, 1908.

in the pelvis. In 2 cases the pathological conditions were so severe as not to warrant searching for the appendix. (In the remaining 10 cases the position of the appendix was not noted.) The appendix was gangrenous and perforated in 4 cases, gangrenous in 4, and in 2 of these had ulcerated off near the base, while in the remaining 17 the appendix was either adherent, congested, swollen, or covered with inflammatory exudate.

The technic in removing the appendix varied with the pathological condition of the organ. In 12 of the acute cases, ligation with catgut and cauterization of the stump was done. In 5 cases the stump of the appendix was invaginated, and held in this position by a purse-string suture of linen thread: in 3 cases simple ligation with linen thread covering the stump with the adjacent serous coat of the cæcum. In 4 cases the appendix was ligated with silk, and the stump cauterized; in one the appendix was amputated flush with the cæcum, and the opening in the cæcum closed by two interrupted Lembert sutures of linen thread.

Drainage was introduced in 16 of the 25 acute cases and consisted of gauze, with or without a rubber or glass drainage-tube. In 8 cases a glass tube was placed in the pelvis. In abscess cavities, one or more pieces of gauze were used, multiple wicks frequently being required to drain the ramifications of the cavities. Rubber tubes were used when there was much to drain; cigarette wicks in a few cases in which there was little to drain. In the 9 undrained cases the wound was closed with tier sutures of chromicized catgut.

Leucocyte counts were made in all these acute cases except six. Of the non-abscess cases, a count of 8000 prevailed in 2 cases, of 9000 in 1, of 11,000 in 2, of 15,000 in 1, and of 16,000 in 1. Of the cases with abscess, there were 7000 in 1, 10,000 in 2, 11,000 in 2, 14,000 in 1, 15,000 in 1, 17,000 in 1, 18,000 in 1, 20,000 in 1, and 22,000 in 2. Thus of the non-abscess cases in which counts were made, in 5 the count was below 15,000, whilst in 2 only, the count was 15,000 or more.

But of the 12 cases with abscess, in 6 the count was below 15,000, and in 6, 15,000 or more. There were two patients, both of whom had been sick equally long before operation (10 days), and in whom the leucocyte count was equal (15,000). One, who had a previous attack one month before, showed an

acute ulcerative appendicitis, with adhesions between the cæcum and appendix, and the posterior parietal peritoneum; the other revealed foul greenish pus at operation. Thus, while in the majority of cases a high leucocyte count is strongly suggestive of pus, yet, as we have just illustrated, cases can be selected which exhibit an equal count, but in which the findings at operation are entirely different. It is this very fallibility which compels the operator to give more weight to the clinical examination, and less to that of the laboratory. We found that differential leucocyte counts were of no more significance in determining the presence of pus than the leucocyte counts alone. The differential count is of moment in judging of the patient's resistance.

Microscopic examination in 18 of the appendices showed that the disease was interstitial in 5, ulcerative in 7, and chronic, with acute exacerbations in 6. Of this last group, namely, those six in which the microscope revealed chronic appendicitis with acute exacerbations, one gave a history of a previous attack, and exhibited adhesions at the operation; one gave no history of previous attacks, but exhibited adhesions at the operation; whilst the remaining 4 gave no history of previous attacks, and had no adhesions.

The fact that in four of these six cases the clinical history,—provided, of course, that it is correct and the patient's memory was not faulty,—and the operative findings did not support the laboratory diagnosis of chronic appendicitis with acute exacerbations, shows either that the microscopical diagnosis, as in cancer, is subject to error, or else that, as occurs in the gall-bladder, there may be latent or masked infections of the appendix which, while causing the patient little or no discomfort,—or at least not enough to impress his memory,—yet leave their marks in the organ, to be revealed only by the microscope.

The Bacillus coli was recovered in cultures taken from the appendix or the abscess in 5 cases.

I desire to call attention to the immediate or remote effects of appendiceal pus. Last year in reporting my Saturday Clinics I referred to the frequency of toxic nephritis in cases of acute appendicitis with abscess, as revealed by examination of the urine previous to operation, and I mentioned its subsidence, usually within a few days after operation. Now I shall speak of some of the post-operative effects of pus. Individually I

might refer to one of the cases whose peritoneal cavity harbored much pus. The patient was 55 years of age, and had been sick eight days. Operation, by lateral incision, carried above and parallel with upper third of Poupart's ligament and into the loin, revealed the peritoneum acutely hypertrophied, the appendix lying mesial to the cæcum, pointing towards the umbilicus, and partly gangrenous and perforated. Pus was found near the liver,—presumably on its way to form a subdiaphragmatic abscess; running over towards the umbilicus, along the appendix; and in the appendix in large quantity. A gauze strip was placed in each of these directions, and a glass tube in the pelvis. While I do not sanction drainage by multiple wicks in acute diffuse peritonitis, yet when the pus is present in definite multiple collections, the latter should be reached, if at all possible, and freely drained, so as to avoid the disastrous and so-called secondary collections, by evacuating them when they are primary collections. Six days after operation, a fecal fistula, at the site of the gangrenous area around the base of the appendix, occurred. After another month, the fistula not having closed, a second operation showed numerous adhesions between the visceral peritoneum of the cæcum and omentum and the parietal peritoneum. These adhesions proved that the drainage had been effectual, and that the omentum had prevented dangerous peritonitis, by exercising its function of throwing out large quantities of exudate about the site of infection. The adhesions were divided, and the fistulous tract obliterated by inverting with a broad base the offending stump of the appendix.

One patient developed, one month after operation, an abscess low down in the pelvis about the rectum. At the first operation no pus was found, but there were adhesions between the visceral peritoneum of the cæcum and the appendix, and the parietal peritoneum of the posterior abdominal wall. There was no note made in this case as to whether or not the pelvis was explored at the time of the first operation, therefore, I cannot say definitely if there was at that time a small collection which had been overlooked, or whether subsequent abscess formation was consequent upon the extension of infection.

Another patient, from whom four ounces of thick, foul pus had been evacuated, developed, shortly after operation, suppurative parotitis, and tonsillitis.

One patient had infection by contiguity of the right Fallopian tube, necessitating removal of the tube.

Pelvic appendicitis in the female I believe to be a not uncommon cause of sterility, therefore one of the many arguments in favor of early operation,—operation if possible before the infection has travelled beyond the confines of this organ.

Three deaths occurred in this series, one in a patient who, one week after operation, developed acute intestinal obstruction. Operation for the relief of the obstruction revealed two areas of gangrene in the lower part of the ileum, which formed part of the abscess wall. One area was three inches long and involved half the circumference of the bowel; the other area situated four inches higher, was still more extensive. Resection of the bowel was necessitated.

The second death occurred in a patient 53 years old who had been sick five days before admission and operation. The abdomen was greatly distended and universally tender, showing diffuse infection of the peritoneum. Operation revealed quantities of thick, foul, yellowish pus, and the appendix free in an abscess, it having separated at its base by ulceration. This was an example of the fulminating type of this disease.

The third death occurred in a patient who had been sick for forty-eight hours before admission and operation. Examination revealed general board-like rigidity, with tenderness. Incision gave exit to a large amount of free pus from the general peritoneal cavity as well as from the pelvis. The appendix, subcæcal, was perforated at the base close to the cæcum,—a second example of the fulminating type. Two subsequent operations were performed to establish free drainage, in the attempt to drain the peritoneal cavity. Postmortem revealed diffuse purulent peritonitis; a large collection of pus between the right lobe of the liver and the abdominal wall; another about the spleen; and perforation of the right cupola of the diaphragm, with bilateral bronchopneumonia.

Of the 30 cases of chronic appendicitis, 17 were in males and 13 in females. The longest appendiceal history was 18 years; the shortest two weeks.

Of the 20 cases in which the number of attacks was definitely stated: 10 had one, 6 had two, 3 had three, and one had six attacks. In these cases the time that elapsed since the last

attack varied from two to five months. The patient (a cornice-worker) who had the greatest number of attacks, had his first one year before operation. He had suffered from constipation during the entire time of his appendiceal history. This latter patient was operated upon six months previously and an appendiceal abscess was evacuated. For sixteen days following this operation the patient was very ill. Two months after discharge from the hospital a fecal fistula developed, which discharged for a period of two months and then closed. Since then the fistula has opened and closed several times.

Two days before re-admission for operation for the correction of the fistula, the fistula re-opened. Operation revealed numerous adhesions, in addition to a hole on the outer and back part of the cæcum, which was surrounded by necrotic, inflammatory material. The fistulous tract, and the diseased appendiceal stump were excised, and the rent in the cæcum closed.

The symptoms complained of were, in 6 cases, sudden, diffuse abdominal cramp, followed by nausea and vomiting, and localizing within a few hours to the right iliac fossa. In 16 cases the symptoms varied. In 10 the pain began in the right iliac fossa, and was variously described as severe or violent, sharp, shooting, cutting or stabbing, or dull, heavy or aching; in some of these the pain spread throughout the abdomen, like that of cholera morbus. Six patients complained of constant or intermittent, dull, aching soreness in the right iliac fossa. In the remaining 3 the symptoms were not noted. In 11 cases constipation was a marked feature.

In 22 of the cases, tenderness over McBurney's point was a constant objective sign. Rigidity, but only moderate, was present. The McBurney incision was used in 18 cases, and the short rectus incision in seven. The purse-string suture was employed in 14 cases, after clamping and removal of the appendix, and invagination of the appendiceal stump.

In 4 cases the appendix was ligated with silk or linen thread, the mucous membrane excised from the stump, the latter cauterized chemically, and covered by the adjoining serosa of the cæcum; in 7 cases the organ was simply ligated with silk. The abdominal layers were approximated with tier sutures of chromicized catgut.

Cholelithiasis.—There were 10 cases of cholelithiasis, 3 in

males and 7 in females. The youngest patient was 29, and the oldest 46 years of age.*

A history of a definite infection, preceding the onset of gall-bladder disease was obtained in 5 cases, in all of which the infection was enteric fever. This disease preceded manifestations of gall-bladder symptoms by a few months, one year, six years, 25 years and 26 years respectively.

The lowest number of attacks was three, those in the remaining cases being designated as numerous. All of the cases had pain and this symptom was described in 4 cases as colic or cramp in the region of the gall-bladder: in 2 cases the pain was noted as severe only, and in the remaining 4, the character of the pain was not mentioned. In all the cases the pain was in the gall-bladder area, in 4 it was referred, in addition, to the epigastrium, and in 4 to the inferior angle of the right scapula. The pain was followed by nausea and vomiting in all of the cases except one, and of these cases a history of chills was elicited in 3.

Various digestive disorders, such as loss of appetite, gastric tympanites, indigestion, catarrhal gastritis, hyperchlorhydria in the shape of heartburn, eructations of sour fluid and constipation were complained of. Jaundice was present at some or other times in 5 cases.

Physical examination revealed tenderness at the site of the gall-bladder in all of the cases; rigidity of the supraumbilical portion of the right rectus muscle in 4, and palpable liver margin in 3.

Calculi were present in the gall-bladder alone in 3 cases, in the gall-bladder and cystic duct in 2, in the gall-bladder, hepatic, cystic and common ducts in 1, in the gall-bladder and common duct in 1, and in the common duct alone, in 1. The walls of the gall-bladder were thickened in 4 cases, the gall-bladder en-

* The analysis of these, as well as of the cases to follow, is presented with the understanding that an undeterminable amount of error is apt to be present, owing to the unavoidability of having to accept the diagnosis of previous illnesses, and description of symptoms entirely from the patient's memory. It is well known that the lay diagnosis is often incorrect, and also that the human memory is very untrustworthy, and apt to respond too quickly at the expense of truth, to the stimulus of the prodding questions of the enthusiastic examiner.

larged in 3, contracted in one, and impacted with calculi in another. Bile was absent in the contracted gall-bladder, profuse in one of the enlarged organs, tarry in another bladder, and darker than usual in 2. Adhesions present in 5 cases, were described as pericystic in 2, between the omentum and gall-bladder in 2, and between the omentum, transverse colon, duodenum and gall-bladder in one. The bile was examined bacteriologically in 6 cases, of which in 3 it was sterile, in 2 the Bacillus coli, and in one the Bacillus typhosus was present.

In 3 cases the gall-bladder was so badly diseased as to necessitate removal. Drainage in these 3 cases of cholecystectomy consisted in one of a piece of gauze to the fossa of the gall-bladder, in one of a piece of gauze in the sub-hepatic space, and a cigarette drain, cleft, with one end above the lesser omentum and the other in the foramen of Winslow, and, in one of a rubber tube in the hepatic duct supplemented by a cigarette drain. In the remaining cases a rubber tube was placed in the gall-bladder in one; in the gall-bladder and the cystic duct in 2 cases; and in the gall-bladder and common duct in 2 cases. A small counter-opening for the emergence of the drainage, was made in 5 cases, in order to allow the laparotomy wound to heal *per primam*, and thus minimize the risks of incisional hernia.

It is my practice when removing the gall-bladder in the presence of infection to drain the stump of the cystic duct when this is feasible, and if not the stump of the cystic, the common duct.

In one case, the appendix, the seat of chronic inflammation was removed at the same sitting.

The most interesting and instructive case was that of a woman, aged 31, who had had enteric fever seven years previous to operation and from whose gall-bladder the Bacillus typhosus was cultivated. She recalled having pain in the gall-bladder during her attack of fever (probably typhoid cholecystitis). Nine months previous to operation, that is, over six years after the attack of enteric fever, her gall-bladder disease from being latent, became active, and at this time she had her first attack. In addition to three attacks, each of which was characterized by severe colicky pain in the right hypochondrium, which radiated to the right scapula, and which was followed by nausea and

vomiting, she had, as other salient features of the disease, loss of appetite, constipation, and profuse sweats on exertion. The latest, or third attack, preceded the operation by two weeks. That these clinical symptoms are explained by the pathological findings, is quite true. There were numerous adhesions between the omentum, transverse colon and duodenum on the one hand, and the gall-bladder on the other. The gall-bladder was contracted, empty and thickened. The bile-ducts were thickened and surrounded by adhesions, and the hepatic and common ducts were greatly dilated. There was a calculus at the distal end of the common duct.

The death occurred in a female aged 29, who succumbed to shock twenty-two hours after the operation. This patient had an endocarditis which was undoubtedly caused by the toxæmia of the gall-stone disease.

Cholecystitis.—In addition to the cases of chronic cholecystitis associated with the 8 cases of cholelithiasis, there were 2 instances of cholecystitis, one of which was subacute and the other chronic, both in females.

The subacute cholecystitis was present in a woman aged 46, who four years previously suffered an attack of pneumonia. The duration of the previous gall-bladder history was not mentioned, if, indeed there was any. However, while in the hospital, the attack occurred, upon which the diagnosis was based. The pain started in the gall-bladder region, radiated to the umbilicus, and back to the gall-bladder. Coincident with the pain were regional tenderness, and rigidity of the supra-umbilical portion of the right rectus muscle. Furthermore, there was distinct, though slight, jaundice. The duration of the attack was three and a half hours.

Abdominal section revealed a gall-bladder the size of a hen's egg, the serous covering of which was opaque, the musculature friable and thick, and the mucosa swollen, and granular. Two ounces of dark reddish-brown bile were removed. Adhesions were present: several, soft and recent between the omentum and colon, and the gall-bladder; one dense and old, between the inferior margin of the liver, near the gall-bladder, and the parietal peritoneum; another, likewise dense and old, between the duodenum and the gall-bladder. The head of the pancreas was hard and

enlarged. The gall-bladder was drained by a rubber tube, reinforced by a cigarette drain.

The laboratory reported the presence of occult blood in the feces, and the colon bacillus in the culture from the gall-bladder.

The case of chronic cholecystitis did not present anything of special moment.

Carcinoma of the Gall-Bladder.—Cancer of the gall-bladder occurred in a man aged 26. There was no family history of carcinoma.

Six months previous to operation, after the evening meal the patient experienced sudden cramp in the gall-bladder region, which was soon relieved by vomiting. Such attacks have occurred frequently since then. Jaundice attended each attack after the third, but was absent in the intervals.

Two months before operation, patient stated that he passed gall-stones per rectum. Five weeks before operation the latest attack occurred, and lasted several weeks. Since the first attack the patient estimated his loss in weight at 27 pounds. At the time of operation the patient was anæmic and slightly jaundiced.

Abdominal section exposed an enlarged, tense gall-bladder, whose fundus and body exhibited nodules. Adhesions existed between the omentum and gall-bladder. After cholecystectomy, drainage, consisting of one rubber tube in the stump of the cystic duct, surrounded by a cigarette drain, and one piece of gauze in the fossa of the gall-bladder, all of which were brought out through a counter opening. Culture from the contents of the gall-bladder proved sterile, but microscopical section of the gall-bladder showed the nodules to be cancerous.

Hepatic Abscess.—This case of abscess should, I think, on *a priori* grounds, be classified under chronic cholecystitis instead of under the heading "hepatic abscess."

The patient, a laborer, aged 49, gave no history of previous infection. Two months before operation he had a chill, which lasted half an hour. The following morning he noticed soreness throughout the epigastrium, with much fulness here. His appetite became poor. A month later the soreness localized in the right hypochondriac region, and now, for the first time, he thought he could feel a mass, which was moderately tender. He had no more chills. The epigastric soreness changed into a gnawing pain,

which appeared, together with epigastric distention, immediately after eating.

The pain in the gall-bladder was occasionally referred to the inferior angle of the right scapula.

The patient stated that he had lost thirty pounds in flesh since the illness began, although it must be borne in mind that his diet was restricted during that time.

Physical examination revealed moderate rigidity of the muscles in the upper right half of the abdomen, some tenderness about the umbilicus and the presence of a palpable swelling. The liver dulness extended nearly to the umbilicus. The stomach was dilated, holding a quart of water.

Abdominal section revealed the gall-bladder thickened, atrophied, and bound down firmly by strong fibrous adhesions; from it fluid bile escaped. There were numerous firm adhesions between the stomach and duodenum and the liver.

An abscess, the size of a small orange, was located one inch beneath the inferior surface of the liver, in close proximity to the fossa of the gall-bladder. Its walls were a quarter of an inch thick and its contents, creamy pus.

Drainage consisted in three pieces of gauze, one in the gall-bladder, one in the abscess cavity, and one in the subhepatic space.

Culture from the gall-bladder proved sterile.

Cirrhosis of the Liver.—There were two cases of cirrhosis of the liver operated upon, of which one was biliary, and the other was an example of Henoch's disease. The latter patient was cholæmic at operation, and died the next day.

Gastric Ulcer.—There was one case of gastric ulcer, in a woman 32 years old. She had had enteric fever eleven years previous to admission.

Her illness began three months before admission with sharp cutting pains in the epigastrium, radiating low in the abdomen: duration, three weeks.

Five weeks before operation there was a second attack, similar to the first, the pain lasting up to within a few days before operation.

Physical examination showed the greater curvature of the stomach four centimetres above the navel.

Abdominal section and gastrotomy revealed the gastric

mucosa congested. It bled readily when touched, and rubbed off easily. Several small areas were especially hemorrhagic. After posterior gastrojejunostomy, recovery was apparently complete.

The appendix, chronically inflamed, was removed at the same time through a McBurney incision.

Duodenal Ulcer.—There was one case of duodenal ulcer, in a man 60 years of age. His illness began nine months previous to operation, with severe dull aching pain in the epigastrium, coming on from one to two and a half hours after eating, and radiating to the shoulders. The pain lasted several hours.

Four months before operation ten teeth were extracted,—an event which naturally increased the severity of the morbidity. Shortly afterwards, the epigastric pain returned, and was followed two hours after eating by vomiting, which relieved the pain.

Three months before operation, after unusually severe pain in the right side of the epigastric region, the patient became jaundiced. From this time on the intervals between attacks were three to five days, and occasionally two weeks: during these intervals the patient was fairly comfortable. The bowels were loose, occult blood was present. The patient stated that during these nine months he had lost twenty pounds in weight.

Physical examination showed the stomach dilated, its greater curvature extending down as far as the navel. There was resistance in the epigastric region, more marked on the right.

Abdominal section revealed an ulcer in the anterior and upper walls of the first part of the duodenum which extended to the pylorus. There was no obstruction at the latter site.

Posterior gastrojejunostomy, no loop, resulted in cure. In this connection I beg to say that in my experience the operation of gastro-enterostomy (no-loop operation) in the presence of an open pylorus has not been followed by the disagreeable symptoms described by some operators. While I was doing the loop operation I did see vomiting, etc., which from my more recent experience, I must attribute in part at least to the former faulty technic.

Carcinoma of the Stomach.—There were 3 cases of carcinoma of the stomach, all in males, aged 34, 37 and 45. There was a family history of carcinoma in all these cases: one patient's

father died of carcinoma of the stomach; another patient's father died of carcinoma of the jejunum, whilst the third patient had a sister suffering from epithelioma of the face. Common symptoms were pain, dyspepsia, vomiting, loss of weight, and in two, constipation. In 2 patients, both of whom had pyloric obstruction, the vomiting was that of retention: in all, the vomitus contained either streaks, or considerable amounts of blood. The loss of weight amounted to 20, 50 and 52 pounds.

The site of the carcinoma was, in one patient, the anterior wall; in another, the pylorus and duodenum; in the third, the pylorus and anterior and posterior walls. In all partial gastrectomy with posterior gastrojejunostomy was done. In all three cases clinical diagnosis was confirmed by microscopical examination. Subsequent history of the patient favorable, with one exception; this man died nine months after operation from what was thought to be recurrence, yet a postmortem was not made.

Carcinoma of the Jejunum.—There was one case of carcinoma of the jejunum, in a female aged 45, whose illness began five months previous to operation, with daily vomiting. There was dull aching pain, boulemia, and loss of twenty-five pounds in weight. Occult blood was found before the operation.

Abdominal section revealed a hard, annular growth three inches beyond the duodenojejunal flexure, of hour-glass shape which caused an almost total stricture, nearly three inches long. Adhesions were present between the pylorus, the inferior surface of the liver, and the lesser omentum. Resection of the jejunum, with end to end anastomosis, and posterior gastrojejunostomy were performed.

Carcinoma of the Intestines.—There were three cases of intestinal carcinoma, one in a male and two in females.

Carcinoma of the colon was present in a male aged 39. A sister had been operated upon for carcinoma of the breast. Six years previous to admission the patient had had an attack of dysentery. Six months before admission there appeared abdominal colic, with obstinate constipation. Three months before admission the patient was operated upon for bilateral inguinal hernia, and during his stay of three weeks in the hospital, he lost 27 pounds in weight, and since then has lost eight pounds, making a total loss of thirty-five pounds in three months. Five weeks before admission the patient noticed for the first time, blood-clots in the stool,

rectal tenesmus and borborygmi. After the operation for the herniæ, the constipation was relieved, but the colic and tenesmus continued. One month before admission the stools became loose and watery.

Physical examination revealed, in addition to emaciation and cachexia, rigidity of the muscles in the left half of the abdomen. There was dulness to the left of the navel, over an area of a little over an inch, and this dulness corresponded to a tender mass.

Abdominal section disclosed a large movable mass, the size of a large orange. Involved in this mass were the small gut and the mesentery. No surgical procedure was employed in this case.

Carcinoma of the cæcum was present in a woman aged 32, whose family history was negative. Five months previous to admission this patient complained of tearing, dragging pain in the right iliac region, followed by soreness over the whole of the abdomen. Six weeks before admission she noticed for the first time a lump in the right iliac fossa, just below the site of the previous pain. The abdomen at this time was swollen, and this swelling increased and decreased alternately.

Physical examination of the abdomen revealed considerable distention but no rigidity. There was general tenderness. A mass, indefinite in shape, hard and nodular to be felt in the right iliac fossa, by combined abdominal and pelvic palpation. There was free fluid in the abdomen.

Abdominal section permitted the escape of dark, thick, serous fluid and disclosed a malignant growth in the right iliac fossa to which the intestines were adherent. The growth was extensive, but sprang, apparently, from the ileocæcal junction. There were metastatic nodules on the uterus and adnexæ, floor of pelvis and anterior abdominal wall. The case proved to be inoperable.

There were 2 cases of carcinoma of the rectum. One, a woman aged 54, whose father's sister had an epithelioma on the forehead.

She had been constipated ten months before admission. Since three months before admission, she had movements the size of sheep-stools, and, at times, passed a little blood. There was rectal tenesmus. Lately, there had been much rectal bleeding.

The patient lost weight. At times there was considerable pain in the sacral region.

Digital examination discovered a large, hard, nodular mass, fixed in the lower half of the posterior wall of the sacrum. The finger was streaked with blood when withdrawn. The operation consisted in left inguinal colostomy.

The second case was similar to the above and too far advanced to allow of other than a left inguinal colostomy, which was done.

Hernia.—There were 12 operations for the radical cure of inguinal hernia, 10 were in males, and 2 in females. Seven of these were on the right side and 4 on the left: in one case the site of the hernia was not recorded. There were two cases of congenital hernia: the father of one of these patients also had a hernia. Trusses were worn in 8 cases. The duration varied from one to thirty years. Four were ruptured by heavy lifting. Concomitant pathological conditions consisted in varicocele in two cases, chronic appendicitis in two, acute appendicitis in one, and in another case, part of the cæcum with the appendix was in the sac. Incisional hernia was present in addition to inguinal hernia and chronic appendicitis in a woman who had had an abdominal section four years previously. There was one ventral hernia.

There were 2 cases of strangulated femoral hernia, both of which recovered.

There were 2 cases of umbilical hernia, both in females. One patient had the rupture for three years, and could assign no cause to it, but notes in the history show that she was very stout, and had borne five children. The other woman acquired the hernia when fourteen years old, or 28 years before operation, by heavy lifting. The hernia protruded two and a half inches beyond the navel, and was seven inches in diameter. Its contents were omentum and gut, and, as is usual in long standing cases, many adhesions. The appendix, the seat of chronic obliterative inflammation, was removed at the same time.

There were two cases of incisional hernia, both in females. One case had in addition an inguinal hernia and a chronic appendicitis. The other patient had been operated fifteen months previously and an appendiceal abscess evacuated through a three inch incision. She then returned to her work in a hosiery mill,

where considerable standing was required. She wore an abdominal belt for a period of eleven months after the operation, and then dispensed with it. One month later the scar relaxed. At operation, numerous adhesions were broken up, and a chronically inflamed appendix removed.

Wandering Kidney.—There were 6 cases of wandering kidney, four in males and two in females, and all on the right side. Analysis of the case histories shows that symptoms, aside from pain, were few. In all cases, the pain was in the right lumbar and hypochondriac regions and varied in character from numbness, or dull and aching, to severe and stabbing, like renal colic. In one case pain was aggravated by standing in one position and in another by motion. In one case it radiated to the glans penis, and, in another, to the right testicle. Pain in wandering kidney so frequently resembles that in renal calculus as often to make the diagnosis very doubtful. Associated with the pain was nausea in one case, and vomiting, which relieved the pain, in another. Urinary symptoms, though usually frequent, are mentioned but once, and here consisted in difficulty in starting the stream. Two patients complained of constipation. One patient had a chronically inflamed appendix removed at the same time. Another had diastasis of the recti with visera optosis, and a split celery-stalk laceration of the cervix. In this instance, conservative treatment, by means of abdominal binder, would probably have fulfilled the indications better than operation. Anchorage, in five cases, consisted in separation of a triangular flap of the true capsule, twisting of this flap, and suturing of it into the anterior layer of the lumbar fascia, and quadratus lumborum muscle. In the sixth case the kidney was anchored by means of polar gauze. The presence of hæmaturia in a percentage of cases of very movable kidney has been my experience, also jaundice in a few.

Pyonephrosis.—There were 4 cases of pyonephrosis, three in males and one in a female. Two were on the right side and two on the left. The etiology of this condition was, in two cases renal calculus; in another tuberculosis. The fourth case, while the cause is not mentioned, I believe was consecutive upon wandering kidney.

Both of the cases which were due to long-standing calculous disease, were in males, and both died. The ideal time to operate would have been of course in the pre-suppurative stage. In all

suppurative states, the surgeon is more or less subservient to the caprices of infection. In one of these patients, the calculous history had existed since the patient was fourteen years of age, or for twenty-seven years. Infection began five months previous to operation, when he noticed for the first time, pus in the urine. In addition to the attacks of renal colic, in which the pain was referred down the right ureter and also to the right testicle, there was dysuria, and profuse sweats at frequent intervals.

Physical examination showed that the patient was anæmic and decidedly septic. There was a tender mass in the right hypochondrium. Nephrotomy revealed a kidney enlarged and disintegrated, from which a basinful of greenish-yellow pus was removed. Near the vesical end of the ureter a softened calculus was removed. The kidney was extirpated. Drainage was established by three pieces of gauze. The laboratory reported chronic suppurative nephritis and ureteritis.

The other patient had had a calculus removed from the left kidney eight months previous to operation, and a month later the calculous history on the right side was inaugurated. The time of inception of infection was not definitely stated. There was progressive loss of weight and strength, increased frequency of urination in the day, and headaches towards evening. Functional activity of the left kidney was established by ureteral catheterization.

Nephrotomy gave vent to a large amount of thick, foul, yellowish pus. The ureter was much thickened, and dilated, and near its vesical end contained a small calculus.

The patient with tuberculous pyonephrosis had had her condition for six years. Seven weeks previous to the present operation an abscess of the left kidney, which had ruptured, was evacuated. However, in spite of this, the same dull aching pain persisted, together with a sinus, which repeatedly opened and closed. Nephrectomy.

Pyelonephritis.—There was one case of pyelonephritis, in a woman aged 31, who gave a definite history of previous infection Two weeks before the operation she noticed for the first time, the urinary symptoms of pain after micturition, frequency and urgency, and consequent passage of small amounts of urine. Ten days before admission, she experienced violent, sharp, shooting pains in the right iliac region, and aggravated by motion. The

next morning and for two days after there were chills, fever, sweats, and vomiting, and up to time of operation constant high fever persisted.

Physical examination revealed marked tenderness in the right lower hypochondriac region anteriorly, and lumbar region posteriorly. Palpation caused exquisite pain.

Nephrotomy showed an enlarged, inflamed kidney that contained a large amount of pus.

Renal Calculus.—There was one case of renal calculus, which occurred in a man aged 52. For twelve years preceding operation this patient had suffered from periodic—*i.e.* every four months—attacks of sharp, cutting pain at a localized point in the left lumbar region, and without radiation. Later on, the attacks were more frequent and severe, and the pain radiated along the left ureter to the testicle. These attacks lasted from one to two hours, were accompanied by chill, and occasionally by vomiting. Nephrotomy, with removal of a calculus from the pelvis of the ureter.

On the eighth day after operation, there was a severe attack of renal colic, followed by increased frequency of urination, and the passage of a shower of calculi, which varied in size from a millet to a mustard seed.

In all my kidney cases it is my practice, with few exceptions, to have cystoscopic and ureteral catheterization; this is done by one of two members of our staff, Dr. Alexander Uhle or Dr. William McKinney. I cannot lay too much stress upon this practice, the importance of which I need not dwell upon, as I am sure all of the Fellows will agree with me in this.

Hypertrophy of the Prostate Gland.—This patient, 65 years old, suffered, more than twelve years before operation, from pain before, during, and after urination; from increased frequency, and, at times, from sudden blockage of the stream, with dribbling. For twelve years he has led a catheter life.

Ten years ago pus and blood appeared in the urine at intervals of three months. On admission, the patient had pain, referred to the end of the penis, occasional priapism, vesical tenesmus, and often difficulty at stool. At operation there was removed by the suprapubic route, a calculus, the size of a peach-stone, and a much enlarged prostate.

Sarcoma of the Prostate.—There was one case of sarcoma of the prostate, which occurred in a patient 69 years of age. Nine months previous to operation he began to suffer from frequency of urination, with dysuria and hæmaturia. On admission, the frequency amounted to one to two hours by day, and five to six times by night. Complains of severe pain in sacrum. Rectal examination revealed the prostate soft, tender, and uniformly enlarged to the size of a large orange.

Suprapubic operation confirmed rectal palpation, and showed, further, that the growth was very vascular, and so soft that it ruptured during manipulation,—an event that necessitated removal piecemeal. The resulting cavity was as large as a fist, and bled freely. Drainage consisted of one Freyer tube in the bladder. Six hours after the operation profuse bleeding, which required gauze packing to control it, occurred. Saline intravenous infusion two quarts, was administered. Microscopical examination confirmed the clinical diagnosis of sarcoma.

Cystoscopic examination in enlargement of the prostate is equally as important as is cystoscopy and ureteral catheterization in kidney conditions.

Carcinoma of the Breast.—There were six cases of carcinoma of the breast, all in women, although last year I reported an instance of this in a male. The ages were from 32 to 45, with the somewhat low average of 37 years. The right breast was involved in five and the left breast in one. One patient gave a family history of cancer, and one a history of traumatism.

The duration was three months in one case, six months in three, and nine months in one. Pain in the breast was described as sharp and shooting in two cases, and stabbing in another. Involvement of the axillary nodes was present in two cases. Radical operation was performed in four cases. In all drainage of the axilla was carried out by means of a rubber tube.

Tuberculosis of the Breast.—There was one case of tuberculosis of the left breast in a woman aged 44. Three years previous to operation, the patient experienced for the first time, pain in the left breast. Five months before operation, she noticed, for the first time, a tumor, which has grown rapidly. Small areas became tender, inflamed and swollen, and then broke down and discharged foul pus. Examination of the breast revealed a round, red, slightly elevated area, the size of a silver quarter,

in the centre of which was a sinus discharging non-odorous pus: this area was situated above, and slightly to the outer side of the nipple. Above this there was another similar area, not so red, and without a sinus. Beneath these spots there was an ill-defined, irregular, fairly hard, moderately tender growth. Radical operation was performed, and the axilla drained by a rubber tube. Microscopical study showed tuberculosis.

Fibroid of Uterus.—There were 8 cases of fibroid tumor of the uterus, of which one was complicated by carcinoma, under which caption it will be considered. The duration of the disease was six weeks in one case, one year in two, two and a half years in two. The pain was dragging or bearing down, lumbar or sacral, radiating down the thigh in one, and aggravated by the menses in another. Metrorrhagia was present in four cases, and in two was profuse and clotted. Four complained of leucorrhœa. In two cases there was increased frequency and urgency of urination. At operation, which was supravaginal, amputation of the body of the uterus and adnexæ in three cases; uterus with the left tube and ovary in two cases; uterus with both tubes and right ovary in one case. The appendix was the seat of disease, and for this reason was removed in five cases. One patient who had a fibroid removed fifteen years previously through the vagina, showed at operation a right intraligamentary cyst; chronic appendicitis, and adhesions between the ileum and the vagina.*

Carcinoma of Uterus.—There were 4 cases of carcinoma of the uterus, all in married women, whose ages were 42, 46, 47 and 49. There was no family history of carcinoma, nor any history of trauma apart from that ordinarily attending childbirth. The duration was three months in one, four months in another, and indefinite in the other two.

Metrorrhagia was present in two cases: in the case complicated by fibroid it contained clots; in the other case it was profuse, and before admission, foul. In all these cases the cervix was the seat of the malignancy.

Operation was performed by the abdominal route in 3 cases, and by the vaginal in one. One case was complicated by fibroid

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* In addition to the above cases of fibroid uterus, an example of subserous fibroid removed by myomectomy will be referred to under "Diseases of the Tubes and Ovaries."

and showed, in addition, chronic appendicitis; the uterus with the adnexæ, the uterine third of the vagina, and the appendix were removed.

Another case was complicated by polyp, and showed chronic appendicitis; complete abdominal hysterectomy and appendectomy were performed. Upon the third patient it was intended to perform trachelorrhaphy and perineorrhaphy, which had existed since childbirth, four and a half years. The cervix showed a stellate laceration, and was unduly hard, thus creating the suspicion of carcinoma. Therefore, the uterus was removed by the vaginal route, and the perineum repaired. The diagnosis of malignancy was confirmed by microscopical examination. Here, then, was a very early carcinoma, springing from the site of a lacerated cervix—and the conclusion may properly be drawn, that trauma was the cause of malignancy in this patient.

Prolapse of the Uterus.—There were four cases of prolapse of the uterus. Operation consisted in vaginal hysterectomy in two; ventrofixation, perineorrhaphy, anterior colporrhaphy, and, incidentally, appendectomy for chronic appendicitis in one, and in the remaining case, Dudleys' operation, together with amputaton of a redundant cervix, and repair of a lacerated perineum. One of these patients had decidedly weak abdomino-pelvic musculature, having been operated upon four years previously, for femoral and inguinal hernia, and lacerated cervix and perineum. There was one death in this series.

Chronic Metritis and Endometritis.—There were 4 cases of chronic metritis and endometritis in multiparæ, of whom two had borne eight children each, and one two children. Operation in two cases consisted in hysterectomy by the vaginal route; in one of these the uterus was, in addition, retroverted. Two cases were cured by complete abdominal hysterectomy, in one, at the same sitting, appendectomy for chronic appendicitis, and perineorrhaphy, for rectocele.

In all these cases the microscopical examination showed arterio-sclerosis and hyperplastic endometritis. It is my belief after a considerable experience in dealing with this class of cases that this is the only rational treatment. I have had the opportunity of observing cases a long time after operation, and in-

variably the immediate as well as the remote results have been most satisfactory to patient as well as surgeon.

This may be thought to be too radical treatment, but in being so radical it is conservative in the true sense of the word in that it is the best possible safeguard against the development of carcinoma which will take place in some of these cases if left alone and more likely to if subjected to traumatism by the ill-advised use of the curette.

Diseases of the Tubes and Ovaries.—There were 12 cases of tubo-ovarian disease. Miscarriages had occurred in five of these patients, one of whom had eight. Of these patients who had had miscarriages, the character of the pain in four betrayed a some-time pelvic peritonitis. The pain was usually in the pelvis, and was sharp, or sharp and shooting, or cutting in seven patients, four of whom had had a miscarriage: this pain was accompanied by chills and fever in two, and was followed by nausea and vomiting in two more. There was bearing down pain in two patients. The pain was referred down both lower limbs in one and up to the inferior angle of the left scapula, and down to the left knee in another, who suffered from left-sided salpingo-oöphoritis. In two cases there was frequency and urgency of urination. The menses were irregular in five patients, of whom four had menorrhagia: they were scanty in another. Dysmenorrhœa was present in five patients; leucorrhœa in five, and constipation in six. Associated conditions consisted of chronic appendicitis in all the twelve cases; retroversion in two, endometritis in two, and bilateral hydrosalpinx in one. The operations consisted of appendectomy in all cases; of bilateral salpingo-oöphorectomy in five, in two of which the uterus being adherent, was freed; of left salpingo-oöphorectomy, with resection of the right ovary, and right salpingectomy in four cases, in one of which a myomectomy was performed; of right salpingo-oöphorectomy in two; and of complete abdominal hysterectomy in another patient, who had a severe fundal endometritis.

In addition to the operations described above, fifty-two others of less interest were also performed in the Clinics.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 22, 1908.

The President, Dr. Joseph A. Blake, in the Chair.

FACIAL NEURALGIA TREATED BY ALCOHOL INJECTIONS.

Dr. Otto G. T. Kiliani presented a woman, 70 years old, who, when she first came under his observation in August, 1907, complained of severe neuralgia of the second and third branches of the facial nerve, of 25 years standing. Her chief pain was in the tip and left side of the tongue. Three injections of 2 c.c. of 80 per cent. alcohol were made into the second branch of the nerve and three into the third branch. The patient remained entirely free from pain until about three weeks ago, when she again complained of some pain in the tip of the tongue which disappeared after a single injection.

As a result of the last injection, the patient had a slight temporary paresis of the left facial muscle. This is due to the connection of the second branch of the trigeminus with the facial nerve through the nervus petrosus superficialis major and the nervus caudi pterygoidei.

Dr. Kiliani presented, also, a man, 55 years old, who was admitted to the German Hospital on September 24, 1906, complaining of frequent pains, with twitching, of the right cheek. His family history was negative, and the patient had been generally healthy up to the onset of his present illness.

Three years ago he began to suffer with mild attacks of pain in the right cheek from the region of the parotid gland forward to the right angle of the mouth and in the lower teeth on the same side. These attacks had gradualy increased in frequency and severity, and when he was admitted to the hospital they would occur every few minutes. The paroxysms were started by any

irritation of the right cheek or of the right lower teeth. He also complained of roaring and impaired hearing of the right ear. The attacks of pain were characterized by an interval of agony, during which the patient rocked back and forth, rubbing the affected cheek with a handkerchief or the back of the hand. The attacks were much more frequent during the day than at night.

On October 16, 1906, the patient was given an injection of 2 c.c. of 80 per cent. ethyl alcohol into the inferior dental foramen. On the two following days he had several hundred attacks of pain. On October 19 he received a second injection, and on the following day he only had six attacks in twenty-four hours. On October 21 he had only three attacks during the day, and for the first time slept well at night. On October 25 he received his third injection. This was followed by a temporary increase in the number of attacks, but on the three following days he was much improved. On October 30 he had a relapse, with fifty or seventy-five attacks during the day and six at night. On October 31 he received his fourth injection, followed by slight improvement. Subsequent to this he received four more injections, and since the last one, which was given on November 17, 1906, he had remained entirely free from pain, a period of about sixteen months.

The severity of this case, Dr. Kiliani said, could be judged by the fact that while in the hospital the patient had had over a thousand attacks of tic. At times he was absolutely insane with pain, requiring the care of two orderlies. Morphine and the bromides apparently gave him no relief.

Dr. Kiliani presented, also, a man, 73 years old, who when 25 years old was struck under the right eye by a fist. Five weeks later he felt needle-like pains of the right side of the face. These were of brief duration, and recurred four or five times daily. After about six months they disappeared entirely for a year. They then recurred in the same location, but were more severe. The attacks would disappear for several months, and then recur, each time stronger, and in 1880 they were so severe that he had a section of the infra-orbital nerve excised. During the next five years this operation was repeated three times without much benefit, and in 1898 he had the Gasserian ganglion resected, after

which he was free from pain for one year. In 1904 he had a secondary operation performed on the ganglion without effect.

When the patient came under Dr. Kiliani's observation, in December, 1906, he was having about a hundred attacks of pain a day. After three injections into the foramen ovale his attacks of pain, as well as his facial tic, disappeared, and he had remained entirely well since.

In explaining the technic of the operation, Dr. Kiliani said the needle was introduced through the cheek externally, and without perforating the mucous membrane it was run up along the pterygoid process to the base of the skull until the foramen was reached.

INTERSCAPULO-THORACIC AMPUTATION FOR SARCOMA.

Dr. Benjamin T. Tilton presented a boy of seventeen years who had enjoyed perfect health up to the latter part of September, 1907, when he fell from a bicycle, striking his left shoulder. Five weeks later he noticed a swelling in this region which gradually grew larger. He began to have very severe pain, especially at night, and was unable to sleep.

When Dr. Tilton saw the patient for the first time, on December 14, seven weeks after the accident, he found a tumor of the shoulder approaching the size of a child's head. The superficial veins were enlarged, and there was an indistinct pulsation. There were no glandular enlargements, but the pectoral muscles seemed to be involved in the growth. On account of the extremely rapid growth of the tumor and the probable involvement of the adjacent muscles attached to the humerus and scapula, it was decided that nothing short of a complete removal of the shoulder girdle would suffice. To this the patient and his family readily consented, as the pain had become intolerable. Interscapulo-thoracic amputation was done by Dr. Tilton on December 16, 1907. The usual Berger incision was made, the clavicle divided at its inner third with a chain saw, and the subclavian vessels exposed and tied. After division of the brachial plexus, the muscles attached to the humerus and scapula were divided in turn, the terminal branches of the three scapular arteries being divided as they were reached. The hemorrhage was very slight, the wound healed promptly, and the boy went home on the eighth day. Since then he had felt perfectly well, and had gained some weight.

A pathological examination of the tumor by Dr. James Ewing showed it to be a giant-celled sarcoma having its origin, apparently, in the head of the humerus, which was completely replaced by the soft tumor, which had also infiltrated the muscles and the shoulder-joint.

RESECTION OF HUMERUS FOR SARCOMA.

Dr. Howard Lilienthal presented a man, about 35 years old, who had been presented at one of the former meetings of the Society, and was now shown again after a year had elapsed since the time of operation.

The case was originally one of round-celled sarcoma involving the upper part of the shaft of the humerus. A section of the growth was removed, and the diagnosis confirmed by pathological examination. An interscapulo-thoracic amputation was indicated, although a simple disarticulation at the shoulder might have sufficed, but the patient absolutely refused to consent to an operation which would involve the loss of his arm.

About a year ago Dr. Lilienthal resected the humerus from the surgical neck down to a point about two and a half inches above the elbow and filled the gap in the bone with an aluminum inter-medullary splint, as devised by Dr. Charles A. Elsberg. When the patient was first shown at a meeting of the Society, some of the members feared that the aluminum splint would in the course of time become dissolved, and Dr. F. W. Murray suggested that it might be replaced with a gold-plated silver splint, the idea being that that would be permanent. Such a splint was subsequently introduced, and it was worn for some months, but it acted as a foreign body and proved useless. During much of this time the patient was receiving injections of Coley's mixed toxins. He failed to improve, however. On the contrary, he began to lose weight, he had a constant pain in the arm, with a discharging sinus. The splint was thereupon removed, and the wound was allowed to heal, which it did very promptly. Although at the time of the original operation unmistakable sarcomatous tissue was left behind, it had apparently disappeared when the splint was removed. The patient now wore a rather cumbersome artificial humerus in the shape of an external apparatus, with which he was able to get along pretty well.

Dr. Lilienthal said the point he wished to bring out in connection with this patient was whether in a case of this character in which there was not yet extensive involvement of the soft parts, as there was in Dr. Tilton's case, it would not be well to think twice before submitting the patient to such a serious operation as an interscapulo-thoracic amputation. In the case he had shown he had no doubt that the use of Coley's fluid had considerable to do with the non-recurrence and the disappearance of the sarcomatous tissue. The final outcome, of course, was still uncertain, but the man was certainly a good deal better off than he would be if he had submitted to an amputation.

ENTEROSTOMY FOR PARALYTIC OBSTRUCTION.

Dr. Ellsworth Eliot, Jr., presented a girl, eleven years old, who gave a history of an attack of appendicitis two years ago, from which she recovered, without operation, after a month's illness. She was admitted to the Presbyterian Hospital in April, 1907, suffering from a second attack of appendicitis of two days' duration, with vomiting, pain and abdominal rigidity and distention. The abdomen was opened through an intermuscular incision and subsequently a short median incision below the umbilicus. A gangrenous appendix was found, containing an enterolith and perforated near its distal extremity. There were no adhesions. There was a considerable amount of free seropurulent fluid in the peritoneal cavity. After removal of the appendix, the peritoneal cavity was irrigated and two cigarette drains were inserted.

The patient continued to vomit for three days after the operation. The bowels moved on the second day, and the patient gradually improved until the seventh day, when there was a rise in pulse and temperature, together with paroxysmal attacks of pain and rigidity over the left lower rectus. On the tenth day the vomiting re-appeared, with constipation and abdominal distention and a small mass could be felt in the hollow of the sacrum. The leucocyte count was 36,000. Upon re-opening the abdomen, the small intestine was found to be greatly dilated, of a dull color, and covered with fibrinous flakes. On separation of the adhesions, an abscess containing several ounces of foul pus, and situated in Douglas's cul-de-sac, was opened and drained. To the edges of a small separate incision above, a distended loop

of the ileum was sutured and a Nelaton's catheter No. 15 was inserted through a small orifice into its cavity.

On the day following the operation, the temperature had fallen from 105° to 102°, the pulse from 150 to 120, and the distention and rigidity were distinctly less. The intestinal fistula discharged abundantly and on the third day, the bowels moved naturally. The local and general improvement continued without further interruption, the catheter being removed at the end of the second week. The persistence of the intestinal fistula required a second operation for its closure, which was done by Dr. Wanbaly three months after her admission to the hospital, the orifice being freed from the parietal peritoneum and closed by Lembert sutures. The patient, at present, enjoys excellent health.

Dr. Eliot also presented a girl, 16 years old, who was admitted to the Presbyterian Hospital on November 21, 1907. She had always enjoyed excellent health until four days before admission, when she was seized with an attack of nausea and constipation which, however, did not prevent her from continuing at her work until 24 hours before she came to the hospital. She then complained of abdominal pain, general in character, associated with vomiting and marked prostration. The patient was apathetic and presented the signs of peritonitis which was general, excepting in the epigastric region, with flatness in both flanks. The extremities were cold. Her temperature, on admission, was 101; the pulse was feeble, ranging from 130 to 140. The leucocyte count was 28,000, with a differential count of 85.5 per cent.

Under chloroform, an intermuscular incision was made into the abdomen, together with a small median incision. The appendix was found firmly bound down, and was not removed. The peritoneal cavity, which was found filled with sero-pus, was irrigated, and a cigarette drain was inserted into the pelvis. Twelve hours after the operation the pulse could not be felt at the wrist. Slight improvement followed infusion and free stimulation, the pulse ranging between 140 and 170, but very faint and irregular. There was, on the other hand, immediate improvement in the abdominal condition, the rigidity and distention being much less marked.

On the second day after operation, the pulse had decreased to 120–130 and was much stronger. The patient had two light

brown movements after enemata, there was still occasional vomiting although the greater part of her fluid nourishment was retained.

The condition continued to improve slightly until the fifth day, when severe abdominal pains, of increasing intensity, especially in the left lower quadrant appeared, and the patient's general condition became weaker. The vomiting increased in frequency and became fecaloid and distention of the entire abdomen became almost as pronounced as at the time of her admission to the hospital. There was dulness in the left flank.

Under chloroform, an incision one inch in length was made in the left flank and a small amount of serous fluid evacuated. A similar incision was made in the median line above the umbilicus, through which an enterostomy was made as in the previous case.

The operation was followed by immediate and complete relief of pain, vomiting and distention, with improvement of the general condition, especially the pulse. After the first few hours all fluids were easily retained. The intestinal fistula discharged freely. The bowels moved first on the third day and afterward at regular intervals. The Nelaton catheter was removed on the seventh day and the orifice promptly closed.

The patient's general condition at present is excellent.

USE OF THYROID SERUM IN THE TREATMENT OF EXOPHTHALMIC GOITRE.

Dr. John Rogers presented a number of patients who had been treated with injections of thyroid serum for exophthalmic goitre. He said that some working hypothesis for the function of the thyroid gland is a necessity in the treatment of exophthalmic goitre. It is therefore assumed that the secretion, being intimately associated with the function of every organ and tissue in the body, contains a principle which controls oxidation and another ingredient governing the vasomotor system. In Graves' disease the secretion is excessive and so increases or "activates" the chemical changes in every organ and tissue and returns in the circulation to its source thus activating the thyroid and making a vicious circle. Any therapeutic measure which breaks this circle tends to cure the disease. As the disease progresses however the thyroid secretion becomes of poorer and poorer

quality and although the vasomotor element seems to be at almost all stages of the process capable of stimulating the heart to overact the so-called oxidative principle apparently becomes less and less efficient.

The antithyroid serum is made by injecting rabbits or sheep with the combined nucleoproteid and thyroglobuline obtained from the human thyroid gland. The serum made from the pathological gland of Graves' disease has probably a better therapeutic effect than that made from the normal organ. Certain patients however do not improve under the administration of antiserum or rather under antithyroid treatment and prothyroid treatment must be employed either alone or in combination with the antiserum. For this purpose there can be given by mouth the nucleoproteid material of sheep thyroids or by hypodermic the nucleoproteid material derived from the normal human thyroid. After some experimentation it was found that sheep thyroid could not be given hypodermically for any length of time without causing unpleasant nervous symptoms whereas human thyroid can be tolerated indefinitely. It is possible that an antibody to a foreign proteid has here to be considered.

CASE I.—Came under observation in June, 1906. She had had typical exophthalmic goitre for about 6 months. The symptoms began with goitre and followed her entrance on the duties of a trained nurse. During June and July, 1906, she received 13 injections of about 10 minims of antiserum and improved enough to lead a hygienic life in the country until November. During November and December, 1906, the injections were resumed about once a week. In January, 1907, the only symptom left was the soft goitre. This has gradually shrunk and at present has entirely disappeared and the result seems to be a perfect cure. The only treatment has been antiserum and general hygiene.

CASE II.—Came under observation in December, 1907. She presented typical exophthalmic goitre with rather severe symptoms of about 3 years' duration, following the strenuous care of a sick child. The goitre was small and firm. Two injections of an active antiserum aggravated all the symptoms and produced nausea, vomiting and diarrhœa. She was then given hypodermically 3 minims of a 1 : 1000 solution of the normal human thyroid nucleoproteid with almost immediate relief.

This has been continued once daily with steady improvement and a softening and a shrinkage of the goitre. The nervousness and sleeplessness disappeared; the pulse which was 140 to 160 after the antiserum injections now averages about 90, and there are no subjective symptoms. It must be supposed in this case that the small, hard goitre produced an excess of a weak secretion; that the antiserum by inhibiting the epithelial chemistry, made the secretion of still poorer quality, but the automatic demand for the secretion forced a large output containing a very poor oxidative portion and enough cardio-accelerator to make the heart beat very rapidly; then the administration of the normal thyroid nucleoproteid, supposed to contain only the needed oxidative part of the secretion, supplied the deficiency and the automatic mechanism did not force the thyroid to over act. As this oxidative enzyme (?) improved the general nutrition the strain upon the thyroid was lessened and its own nutrition in turn improved and a gradual restoration to the normal is occurring.

CASE III.—Presented a typical picture of exophthalmic goitre with cutaneous pigmentation and a small hard goitre. There were also signs of a melancholic psychosis. The symptoms were of about 7 years' duration, with exacerbations and remissions. In September, 1905, the pulse averaged about 140. Under antiserum injections, about twice weekly, all symptoms disappeared towards the end of December, and she returned to work as a machine seamstress. In February, 1906, there was a moderate exacerbation of thyroidism which was subdued by antiserum, and in August a repetition of this. At the next exacerbation in January, 1907, the right lobe and isthmus of the thyroid were removed in hopes of a cure. Recovery of full strength was very slow, but after several months of good hygiene in the country she returned to work in September, 1907, apparently in perfect health. Nevertheless about the first of January, 1908, she reappeared with the typical symptoms, a pulse of 140 and pronounced melancholic depression. As she might be supposed to be suffering from an excess of a poor quality of secretion from a damaged and mutilated gland, she received 5 minims of the 1 : 1000 solution of human thyroid nucleoproteid once daily for a week. The symptoms almost immediately subsided and now she is apparently normal again.

CASE IV.—Came under observation in February, 1906. She

presented a typical picture of exophthalmic goitre with a pulse of 110–120, but with pronounced nervous symptoms, especially sleeplessness. The thyroid was about three times as large as normal. Under the antiserum injections all symptoms had practically disappeared at the end of two months, but the patient was exceedingly weak and prostrated. Instead of waiting and allowing the general nutrition to improve and with it the thyroid and the character and quality of its secretion, the antiserum, after a brief respite, was again administered and nausea with a bad diarrhœa and emaciation followed. It may be presumed that prothyroid treatment, to help out the impaired chemistry in such organs as the liver and gastro-intestinal tract, was needed instead of antithyroid serum. The bad condition finally forced an abandonment of the antiserum and under general tonic treatment much improvement followed. The patient returned to Sweden for a vacation in July, but a relapse followed and in September, 1906, in Stockholm the right thyroid lobe was removed and the left superior thyroid artery tied. She seems to have barely escaped death after this operation, and recovery was very slow and incomplete. November, 1907, she presented herself again with all the typical signs more pronounced than in February, 1906, with a pulse of 140–150, but she had gained greatly in weight and was very stout. As there was presumably an excess of a secretion of very poor quality from the mutilated and damaged gland, she was given $^1/_{200}$ of a grain of sheep thyroid nucleoproteid by mouth four times daily. There was an almost immediate loss of superfluous fat, a gain in strength and sleep became natural, and the pulse now averages about 90 to the minute, but the exophthalmos and goitre are as bad as ever. The sheep thyroid nucleoproteid is supposed to be in just sufficient dose to supply the (thyroid) needs of the liver and gastro-intestinal tract, thus at the same time improving the general nutrition and with it that of the patient's thyroid gland and the quality of its secretion, and also relieving the strain on the thyroid. If the sheep thyroid nucleoproteid is given in excess it aggravates the thyroidism apparently by passing into the circulation and activating the thyroid.

Case V.—Was a child of 13, with a large simple goitre, who shows the apparent essential unity in the origin of all goitres and their rational treatment. The goitre here was first noted a year

previously when the patient was growing rapidly and much pressed with studies and night work. In September, 1907, the goitre extended from the chin to the sternum and was tense and smooth. The child was anæmic, thin, very restless and wakeful at night, but had no Graves' disease symptoms, except the pulse after excitement or exertion often rose to 120–130. She was given $^1/_{200}$ of a grain of sheep thyroid nucleoproteid, taken out of school and kept in bed during the morning and as quiet as possible on the porch after luncheon. Now three months have passed and she has gained 15 pounds in weight and is perfectly normal except for the rather large soft goitre. The neck measures 3 inches less in circumference.

Here nervous and physical strains in a growing child may be supposed to have overtaxed the thyroid which hypertrophied to supply its needed secretion. Rest and thyroid proteids by mouth relieved the demands on the thyroid and at the same time aided nutrition. Surgical removal of part of the goitre would probably have made a bad condition worse. From these examples it can be inferred that surgery offers by no means an ideal treatment for Graves' disease. The operation is not free from danger and relapse or failure to cure in addition to a protracted convalescence has been so common in his experience that he believes the specific anti- or prothyroid treatment should always be tried first. He has lately found that cases which do not yield readily to the anti-serum will often do much better after ligation of one or both superior thyroids. This can be done under cocaine and is entirely without risk. Specific treatment subsequently then seems much more efficacious. It is far easier to give the counter-indications for operation than it is to choose the patients who will do well. The acute severe types of Graves' disease especially if fever is present are notoriously bad risks. He has also found that the rather rare type with psychoses are prone to die soon after operation. Almost the only cases in which operation seems to be indicated, if the serum can be obtained, are those who have possessed for years a nodular irregular goitre and who develop signs of thyroidism long after the goitre. Excision of the most diseased lobe seems generally curative. But after all operations on patients with Graves' disease a long period of convalescence must be expected, and during this period the utmost attention must be given to the general health and to careful hygiene, other-

wise a relapse is common. Time must be given for the overtaxed and worn out thyroid to regain its nutrition and capacity for normal functionation.

MADELUNG'S DEFORMITY OF THE HANDS.

Dr. Willaim B. Brinsmade presented a girl of fifteen years; family history good. The only history of injury that could be obtained was that her arms were once twisted by a small boy, but this seemed to have made no impression at the time.

About September, 1905, the mother first noticed a prominence of the right ulna, the deformity gradually increasing and attaining its present size early in 1907. The following November the mother noticed a prominence of the left ulna at the wrist.

Examination showed a bowing of the radius more marked in the right arm than in the left. The right carpal bones were separated from the radius and displaced forward. The same condition existed on the left side, but to a less marked degree. There was a slight bowing of the right tibia, and the patient had a tendency to lean to the right side after standing for a time. There were no exostoses. The urine was normal, and the blood examination was negative. The patient had measles and whooping cough as a child, but had otherwise enjoyed good health. She was undersized, as were her parents, but was unusually intelligent and well developed.

Pels-Leusden in speaking of this rather rare deformity—says that more recent investigations show a luxation of the radio-ulnar rather than the radiocarpal joint. He also says that formerly, curvature of the radius, pressure atrophy, muscular traction of the more powerful flexors and rhachitis were held responsible for the deformity.

He showed by X-ray pictures of the hand that disturbances of growth exist similar to that seen in multiple cartilaginous exostosis. The arrangement of the intermediary cartilages was irregular and ossification on the ulnar side premature, and aside from this other growth disturbances were seen, such as diminished longitudinal growth and swellings and fissures in the vicinity of the epiphyseal lines.

Pels-Leusden therefore concludes that the lesion primarily involves the intermediary cartilages and has nothing to do with rhachitis.

FIG. 1.

Madelung's deformity of the hand.

FIG. 2.

Madelung's deformity of the hand.

A careful examination of the X-ray plates (Figs. 1 and 2) showed a condition which corresponded to the description given above.

REFERENCES.

[1] Archiv. f. klin. Chir., Bd. xxiii.

[2] Bruns. Beitrage. f. klin. Chir., vol. 48, p. 179.

[3] Centralblatt. f. Chir., 1907, p. 190.

[4] Siegrist. Deutsche Zeitschrift für Chirurgie., Jan. 1908, an elaborate article which contains a complete review of the subject with all the published cases.

PLATE FOR DEFECTS OF THE SKULL.

DR. CHARLES A. ELSBERG presented a boy of 10 years who was admitted to Mt. Sinai Hospital on May 22, 1907. One-half hour before admission he had fallen out of a second story window. He was brought to the hospital in a semi-conscious condition, with clonic and tonic convulsions of the right side of the face and of the right upper extremity. There was a large hæmatoma in the left parietal region. At the operation by Dr. Lilienthal there was found a depressed fracture, with considerable splintering of the fragments and an irregular fissured fracture running across the median line to the right parietal region. A large amount of bone had to be removed. There was a large extradural blood clot. Forty-eight hours after the operation there was a complete paralysis of the right side of the body. In the belief that there was blood underneath the dura, the boy was again anæsthetized, the wound reopened, and the dura incised. A very profuse hemorrhage followed, which could only be controlled by tight packing with gauze. The patient recovered from this operation after a long and complicated convalescence. Finally, he was left with a large defect of the skull; there was a depression so large and deep that the greater part of the closed fist could be inserted into it. The deformity was a very unsightly one, and the parents of the child were anxious to have something done to remedy it. On August 26th Dr. Elsberg made a large flap over the defect in the skull, turned down the skin, and inserted an aluminum plate of his own design. The result was a very satisfactory one. The wound was entirely closed, and healed by primary union; the boy was discharged cured on September 21.

The splint employed in this case was made of aluminum, which can be cut into the shape desired without trouble. The plate has a number of arms which can be cut off at different

lengths to fit into the irregular defect. The ends of the arms are split longitudinally for a short distance, and one part of the arm then bent downward. The entire plate is then bent to conform to the general shape of the skull. When in place, one part of the extremity of the arm rests on the outer surface of the skull along the edge of the defect; the other part rests against the cut edge of the skull along the margins of the defect. The plate is kept in position by a few catgut sutures which attach the horizontal part of the extremity of each arm to the periosteum.

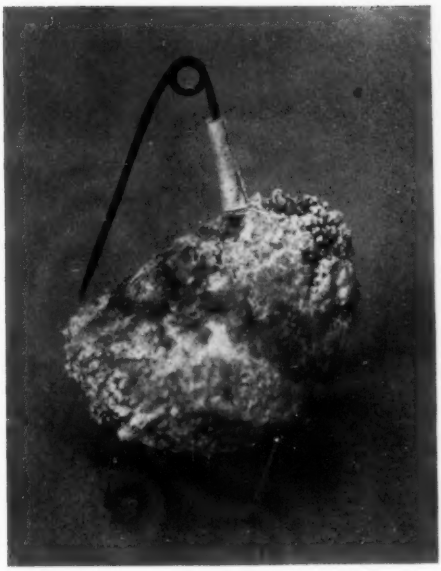
The advantages of this plate are the following: It forms a perfect arch, and the more pressure is put upon the arch from the outside, the firmer and stronger it becomes. It remains in place and makes a firm support,—bridging over the defect of the skull. It is easily made, easily inserted, and can be bent into any shape desired. It has none of the faults of plates which rest on the outside of the skull and are apt to shift their position, or of plates put inside of the bones, which rest directly upon the dura or the brain.

Dr. Lilienthal said he could corroborate Dr. Elsberg's statement in regard to the enormous size of the opening left in the skull at the time of operation. The defect was very marked, and the splint certainly did excellent work in this particular case.

VESICAL CALCULUS CONTAINING AN OPENED SAFETY-PIN AS A NUCLEUS.

Dr. Alexander B. Johnson presented a male, 17 years old, a deaf mute. When he was admitted to the hospital on December 26, 1907, he gave a history of indefinite duration, complaining of painful and frequent urination, with intense spasms of pain at the end of the act. His urine was cloudy, sometimes bloody, and during the past ten weeks all his symptoms had been aggravated. An X-ray picture showed the presence of a large calculus in the bladder. The stone was removed by a suprapubic incision with some difficulty, since the limb of a large safety-pin was imbedded in the centre of the calculus, while the other end, with the pointed extremity of the pin, projected into the cavity of the bladder. The pin was broken during its extraction. The stone weighed 717 grains (Fig. 3). The bladder was the seat of an intense cystitis. It was sutured with two rows of fine chromic gut, mattress stitches being used in the first layer, and continuous sutures in the second. The external wound was drained with a

FIG. 3.



Vesical calculus having as its nucleus an open "safety-pin."

rubber tube extending into the space of Retzius. At the end of a week there was slight leakage, which soon ceased when the patient resumed the erect position.

At the present time, 22 days after the operation, the suprapubic wound was healed and only a slight cystitis remained. The patient had never stated for what purpose he introduced the safety-pin into his urethra, nor would he acknowledge that he had even seen that particular safety-pin before. Inasmuch as it must have been introduced closed, but was found opened in the bladder, we must either assume that the muscular contractions of the bladder wall opened it, or that it was opened in the deeper part of the urethra by the patient himself in his efforts to extract it, and that it found its way into the bladder in the open condition.

Dr. Howard Lilienthal said the probabilities were that the pin was introduced into the urethra closed with the point towards the meatus, and that after it had gotten beyond the boy's reach it had been opened by his efforts to extract it. Then it was either pushed back into the bladder, or worked its way in. The speaker said he had recently seen the statement that if an open safety-pin was swallowed, it would almost uniformly remain in that position in which it had been swallowed and work itself out in that way, and that such a pin would usually pass through the stomach and intestines easier than an ordinary pin would.

Dr. Johnson thought it probable that the boy had inserted the pin closed, with the lock outwards. When it passed into the deep urethra he had probably made desperate efforts to push it out, resulting in the opening of the pin, and then it had worked its way into the bladder. The speaker said he had seen quite a number of cases of foreign bodies in the male bladder, among them bits of chewing gum and fragments of catheters.

PYONEPHROSIS OF A CONGENITALLY MISPLACED KIDNEY: NEPHRECTOMY.

Dr. Alexander B. Johnson presented a boy, 12 years of age, who was admitted to the hospital on September 22, 1906. For the previous two months he had suffered greatly with pain in the region of the umbilicus, and he stated that he was never free from pain unless lying down. He frequently had attacks of vomiting shortly after eating, and for five weeks prior to admission he had increased frequency of urination and a sharp pain at

the end of the penis after voiding urine. The urine had become turbid.

The abdomen was somewhat distended, with moderate tenderness to the right of the umbilicus. No masses were palpable. A rectal examination was negative, with the exception of slight tenderness anteriorly. The urine contained many renal cells, a moderate amount of pus and a few red blood cells. Temperature on admission, 101.8; respirations, 28; pulse, 108.

Operation, September 22, 1906: An incision was made to the left of the median line, examination having revealed a mass about the size of a lemon just above the umbilicus on that side. This was fairly hard and movable, and proved to be retroperitoneal in location. The peritoneum was thereupon incised and separated from the mass, which was found to be a low, obliquely placed malformed kidney, with a dilated ureter. A normally placed kidney was found on the right side.

Upon removal of the malformed left kidney, its pelvis was found to contain two ounces of pus. A sound passed through the ureter into the bladder detected no calculi. A two-inch drain was introduced into the wound; the patient made an uneventful convalescence, and was discharged cured on October 26, 1906. The wound healed by primary union excepting for the drainage sinus, which closed by granulation.

On section of the excised kidney, many pockets of pus were found. Considerable good kidney tissue remained, however. The pelvis and ureter were much dilated, with thickened walls. A culture made from the kidney pus showed Staphylococcus aureus in pure growth.

The blood supply of the kidney, both arteries and veins, was derived from the internal iliac vessels by short straight trunks. The position of the misplaced kidney was in front of the left sacro-iliac joint. The ureter was about three inches in length. At the present writing, 18 months after the removal of the kidney, the boy was in good health.

THE VALUE OF ENTEROSTOMY AND OF CONSERVATIVE OPERATIVE METHODS IN THE SURGICAL TREATMENT OF ACUTE INTESTINAL OBSTRUCTION.

Dr. Charles A. Elsberg read a paper with the above title for which see page 738.

In connection with his paper, Dr. Elsberg showed three patients upon whom he had operated by this method.

Dr. F. Kammerer said he quite agreed with Dr. Elsberg as to the advisability of enterostomy in a certain class of cases of intestinal obstruction, especially in chronic cases in which the condition was complicated by an acute crisis. The speaker said that, in his experience, cases of that character did very badly after even the very slightest operative interference; they were generally cases of carcinoma of the large intestine, and the patients were usually cachectic and in a mild chronic septic condition. The local conditions at operation were also against the patient. He referred to the at times enormous distention of the intestines, to the difficulty of preventing rupture of the serosa during manipulation, and under such circumstances he would be inclined to limit himself to a simple enterostomy as a primary measure.

In acute intestinal obstruction, however, the speaker said he did not quite agree with Dr. Elsberg. Of course, one could understand how an enterostomy would afford permanent relief in certain cases; such, for example, in which the obstruction developed very soon after operation for an acute inflammatory condition and was in all probability due to mechanical conditions dependent upon inflammatory exudation and adhesions. That the latter were absorbed and frequently disappeared in the course of time was well demonstrated in the dense adhesions that were often observed surrounding an inflamed appendix, and of which no trace could be found at a subsequent operation. In cases of acute intestinal obstruction due to permanent mechanical conditions, in which no later relief of this kind could be expected, Dr. Kammerer was in favor of always searching for the seat of obstruction and removing it, if possible. In such cases we were dealing with patients in a better physical condition, and a more prolonged operation was justifiable than in the cases of chronic obstruction with cachexia.

In the statistics quoted by Dr. Elsberg, showing the relative infrequency of gangrene after obstruction, apparently there were included many cases in which the cause of the obstruction was found and relieved at the time of the primary operation. Many of these cases, however, had they been treated by a simple enterostomy without relieving the cause of the obstruction, would

have gone on to gangrene, and would have greatly increased the percentage of mortality from this source. The low rate of mortality from gangrene, computed by Dr. Elsberg, should therefore be revised. At all events it should not be quoted in favor of simple enterostomy in cases of acute intestinal obstruction.

Dr. Ellsworth Eliot, Jr., thought that the indication for enterostomy depended largely upon the type and duration of the obstruction and the condition of the patient. If the case was seen early and the condition of the patient was good, he saw no reason why an attempt should not be made to determine the nature of the obstruction and relieve it. In several of the cases Dr. Elsberg had mentioned obstruction had followed the formation of adhesions, appearing several weeks after operation for acute appendicitis. In cases of that character, the speaker thought relief could safely be afforded by the separation of the adhesions if the operation were done within a few hours after the onset of the acute symptoms. He had had at least a half dozen of this character, in all of which recovery had been obtained by this means without resorting to enterostomy.

In cases of intestinal obstruction that were seen late, Dr. Eliot said he agreed with Dr. Elsberg as to the advisability of an enterostomy, irrespective of the type of the obstruction. Even here, however, if the condition of the patient would warrant a short exploration, he saw no reason why it should not be made to determine the presence or absence of necrosis. Such a type of obstruction might reasonably be inferred by the turbidity and odor of the peritoneal fluid. If the latter condition was found, it should be dealt with in the manner suggested by Dr. Elsberg.

The more favorable results of enterostomy to-day over those obtained a number of years ago were probably due to the fact that the operation was now done more quickly, speed being a very essential factor, and that a very much smaller opening was made than that advocated by the older surgeons, among them Treves. In speaking of the gratifying results of enterostomy in certain conditions, Dr. Eliot referred to a case of acute obstruction of several days' duration in a man 72 years old which was supposed to be due to a carcinoma of the large intestine, but upon opening the abdomen it was found to be due to a stricture from an old peritoneal band. This was divided, and at the same time a small opening was made in the transverse colon above the site of the

band through which a catheter was introduced for ten days. There was no subsequent development of the obstruction, and the fecal fistula closed promptly on the withdrawal of the catheter.

In speaking of enterostomy in connection with intussusception, Dr. Eliot said that several years ago he had had occasion to study this condition rather carefully, and he had found that in cases of intussusception, in infants under one year, the operation of enterostomy, *per se*, had not been followed by recovery in a single instance. Dr. Elsberg, therefore, could be excused for his unfortunate result in the case of intussusception he reported, in which the operation had been done quickly, and where reduction was satisfactorily accomplished. The result depended largely on the condition of the patient. Some two or three years ago, in a paper which he read before the American Surgical Association, the speaker reported a number of cases of intussusception, including two successive instances of operation during the same afternoon, one on a six-months-old infant, the other on a two-year-old child, and in both reduction was accomplished quickly and satisfactorily, the entire duration of each operation being less than 15 minutes. The two-year-old child was rickety and at the end of 72 hours died; the six-months-old infant was in good condition and promptly recovered.

Dr. Eliot believed that enterostomy in such cases was contraindicated.

Dr. Willy Meyer said that while the favorable statistics quoted by Dr. Elsberg might lead one to agree with him regarding the value of enterostomy as a conservative operative measure, yet the fact should not be overlooked that the result depended largely on the condition of the patient and the degree of intestinal distention. No general rule could be laid down in regard to the treatment of these cases. If the cases were seen early and the general condition was favorable, he was in favor of trying to find and relieve the seat of the obstruction at once, and personally, the speaker said, he was inclined to avoid an enterostomy in the ordinary intestinal operations if the patient's condition was such as to warrant its omission. One of the great dangers, confronting the narcotized patient, was fecal vomiting with aspiration. He wished to again call attention to the great advantages offered in such cases by the use of Kausch's œsophageal narcosis tube. If the tube were properly placed, the intestinal contents above the

seat of obstruction would run through the open pylorus into the stomach and thence through the tube outward into a pail beneath the operating table. Aspiration-pneumonia could thus be avoided, also the necessity of emptying the distended bowels through an incision during the operation, in order to be able to replace them.

Dr. L. W. Hotchkiss thought that all would admit the value of the general principle of enterostomy in acute intestinal obstruction, and Dr. Elsberg's paper had emphasized in a timely way the value of conservative operative methods in a class of cases where we were too apt to try and do too much. Certainly his results in the eleven cases reported in his paper were very striking. In the class of cases in which he applied it, it was apparently a life-saving measure, and it was quite possible that in many of these borderline cases we too often attempted to relieve everything and sometimes no doubt at the expense of the patient.

Dr. Joseph A. Blake said a distinction should be made between cases of strangulation ileus and those due to obturation and compression. In the first class, an enterostomy alone was not sufficient, while in those due to obturation or compression an enterostomy might in many instances suffice. Many of the cases of post-operative ileus were not caused by any very marked compression of the intestine, but were rather the result of a disturbance of the function and motility of the gut, and under those conditions even a slight degree of constipation might produce kinking. In dealing with such cases, careful lavage of the stomach and lower bowel might in many instances render even enterostomy unnecessary.

Too much stress, Dr. Blake said, should not be laid on the rôle played by enterostomy in cases where the obstruction was already relieved, for under those conditions it was questionable whether the enterostomy alone was responsible for the patient's recovery. In cases of chronic obstruction, with an acute exacerbation, enterostomy was advisable. Dr. Charles L. Gibson, some years ago, looked up the statistics of a large number of cases of gangrenous hernia, and his figures showed that immediate resection gave only about one-half the mortality of an artificial anus.

Dr. Elsberg, in closing, said that in the list of cases he reported there were quite a number of patients with ileus due to strangulation or obturation. Not all of them were treated by enterostomy alone; in quite a number the obstruction was imme-

diately found and relieved. In his conclusions he had stated that an enterostomy should be done if at the time of opening the abdomen the patient's condition was not good and the obstruction was not at once found and easily relieved.

Several of the speakers, in discussing his paper, had referred to the condition of the patient. It was often very difficult to judge of the condition of the patient—whether he could stand the operation or not; that factor was a rather uncertain one. After considerable trouble to find and relieve the obstruction, and to complete what one considered a very successful operation, the patient frequently died. This happened in from 50 to 80 per cent. of cases in the hands of surgeons all over the world. The results would be better if we did the operation in two stages; at first simply relieving the acute symptoms, rather than going ahead and completing the operation in the face of unknown difficulties.

Stated Meeting, Held February 12, 1908.

The Vice-President, DR. ELLSWORTH ELIOT, JR., in the Chair.

PERFORATING GASTRIC ULCER.

DR. JOHN A. HARTWELL presented a man 31 years old, who was admitted to Bellevue Hospital on January 12, 1908. His family history was unimportant, with the exception of the fact that his father died of intestinal obstruction of unknown cause. The patient stated that he indulged in periodical sprees, usually drinking beer. He was a heavy smoker: no drug habit. He had an attack of gonorrhœa ten years ago: denied syphilis. He had an attack of rheumatism six years ago, and had had occasional attacks of influenza and bronchitis.

Gastric History: The patient stated he never had any previous stomach trouble excepting one slight attack of indigestion some years ago. One week before admission he began to be troubled with gastric disturbance, nausea and vomiting. This continued for five days, during which time the patient felt indisposed, but he was able to be about and eat a little. This had followed a rather free drinking bout, which was assigned as its cause. The night prior to admission the patient was taken with severe pain in the abdomen, and vomited three times. The

vomitus was brownish in color and watery, but never contained any blood. He took some calomel, and felt better in the morning. After a movement of the bowels he had another attack of vomiting, with intense stabbing pain in the epigastrium. This pain was so severe that an ambulance was called and the patient taken to Bellevue Hospital.

On admission, his temperature was 98.8; pulse, 62; respirations, 32; leucocyte count, 20,000. The patient was well nourished and his general appearance was healthy, although he showed evidence of severe suffering. The respiration was almost entirely thoracic in type, and he lay on his back or partially on the right side, with the thighs well flexed on the abdomen. The abdominal muscles were rigid and scaphoid abdomen was present. Palpation revealed a very general tenderness, rather more marked in the right hypochondriac and umbilical regions. The percussion note was tympanitic throughout, and the liver dulness was considerably obscured by free air in the peritoneal cavity. No actual masses could be felt, though the resistance over the area of tenderness was more marked than elsewhere. A probable diagnosis of acute perforating appendicitis, with a high-placed appendix, was made, and an operation was done about eighteen hours after the onset of the attack on January 12.

Incision was made through the right rectus muscle, one inch from the median line above the umbilicus. The peritoneum was opened, the appendix located, and was found congested, though not adherent. It evidently was not sufficiently diseased to be the cause of the symptoms. Appendectomy was performed without inverting the stump. The gall-bladder and ducts were explored, and found normal, as was also the right kidney. The transverse colon was found to be elongated and drawn downward toward the right iliac fossa. It was adherent to the ascending colon by a broad band of adhesions. These were ligated and the colon straightened. The stomach was then exposed and a round ulcer found on its anterior surface, near the pylorus. An indurated area, nearly one half inch in thickness and two inches or more in diameter was found on the lesser curvature, near the pylorus, riding over the anterior and posterior surfaces. In the centre of this, on the anterior wall, the ulcer had perforated. Fluid and gas were escaping in small quantities. The perforation was closed with a purse-string suture, re-inforced by several

Lembert sutures. The transverse colon was so adherent that its convex border was incorporated into the outer row of these sutures. The pylorus was examined by invagination, and found to be very much constricted. A posterior gastro-enterostomy was therefore performed by the "no loop" method with clamps and sutures. A large cigarette drain was inserted down to the site of the ulcer, and the abdominal wound closed in layers. The patient was returned to the ward in good condition, and made an entirely uneventful recovery. The wound healed *per primam* excepting at the track of the drain, through which there was a slight serous discharge for a week. The temperature rose to 101 and the pulse to 118 on the day following the operation. Four days later they became normal, and remained so thereafter. During the first thirty-six hours after the operation the patient received nothing in the way of nourishment, and was given salt solution by rectum. Forty-eight hours after the operation he retained a small quantity of water by mouth, but promptly vomited one ounce of malted milk, and had a considerable amount of gastric pain. He was given nothing further by mouth until the following day, when he received a small amount of peptonized milk, which he retained without trouble. This was continued in increasing quantities, other food being added to it until on the sixth day he was receiving a rather generous diet. The case was presented because of the total absence of symptoms from an ulcer of evidently long standing which involved such a considerable extent of the stomach wall near the pylorus.

SPINDLE-CELLED SARCOMA OF THE STERNUM SUCCESSFULLY TREATED WITH THE MIXED TOXINS OF ERYSIPELAS AND BACILLUS PRODIGIOSUS.

DR. WILLIAM B. COLEY presented a woman, 38 years old, whose mother died of tumor of the brain twelve years ago. The patient had always enjoyed good health until June, 1906, when she noticed an enlargement of the upper portion of the sternum, especially marked over the sternoclavicular joint on the right side. This slowly increased in size up to December, 1906, when Dr. Coley first saw her in consultation with Dr. David John of Yonkers, N. Y. At that time her general condition was fair. There was a tumor the size of half an egg in the upper portion of the sternum, extending to the right over the sternoclavicular articulation. In consistence it was moderately soft, but not fluctu-

ating. The patient gave no tuberculous personal history, although several uncles and aunts had died of tuberculosis.

Soon after the tumor was discovered, Dr. John had put the patient upon potassium iodide, but this treatment had no influence upon the growth. Dr. Coley advised an exploratory incision to confirm the clinical diagnosis of sarcoma. This was done by Dr. John on December 29, 1906, and the specimen removed was examined by Dr. James Ewing of Cornell University, and Drs. B. H. Buxton and Martha Tracy of the Loomis Laboratory, who pronounced it spindle-celled sarcoma.

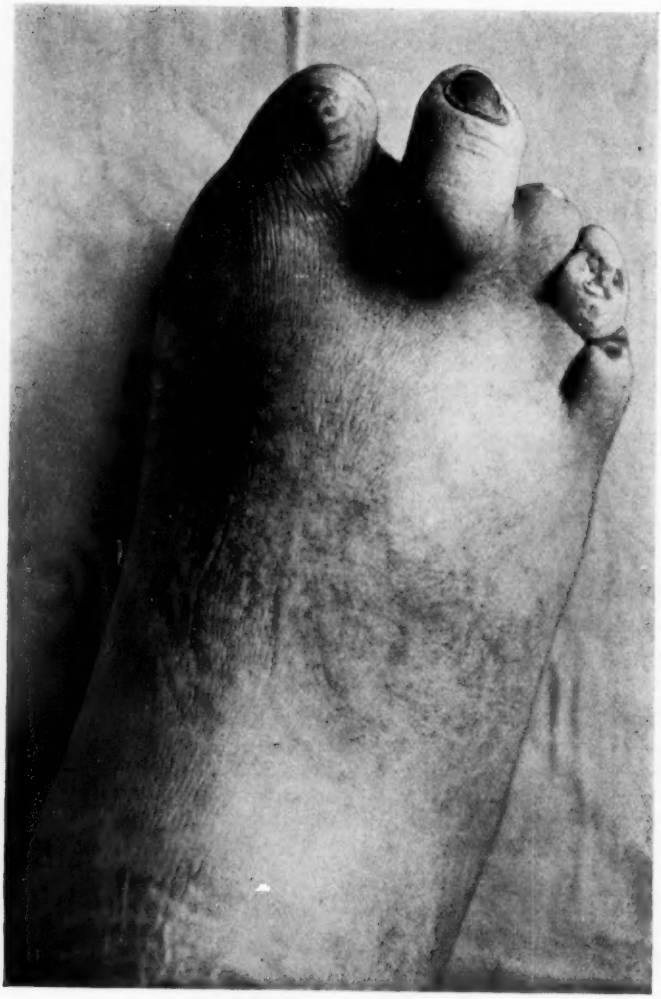
On January 6, 1907, the use of the mixed toxins was begun by Dr. John under Dr. Coley's direction, the initial dose being one-half minim injected into the neighborhood of the tumor. This was followed by a chill and a moderate rise of temperature. The treatment was repeated every other day in gradually increasing doses, and by the end of January the dose had reached two and a half minims, which was followed by a temperature of 103 to 104. After twenty injections had been given, the tumor had diminished considerably in size, and treatment was suspended for two weeks.

Examination on February 25 showed the tumor to have again markedly increased in size, and a small lump was felt beneath the sternomastoid muscle. This increased in size for the first month. The injections were resumed and continued every other day in gradually increased doses until the end of March. Then the injections were given at varying intervals, being discontinued again for a brief period in July, as the patient complained of very severe headaches, sleeplessness and depression. She received her last injection in July, 1907. The tumors in the neck above the clavicle increased markedly in size until the dose had become very large, when they began to slowly decrease in size. About the middle of June, some breaking down was noticed in the sternal tumor, followed by a slight discharge of necrotic tumor tissue, which continued for six months, when it ceased entirely. The highest dose, reached very gradually, was thirty minims. This caused a very marked reaction, and severe prostration. Most of the injections were made outside of the limits of the tumors. The patient had received no treatment now for more than seven months. The tumors continued to slowly diminish in size after the cessation of the treatment, and

FIG. 4.

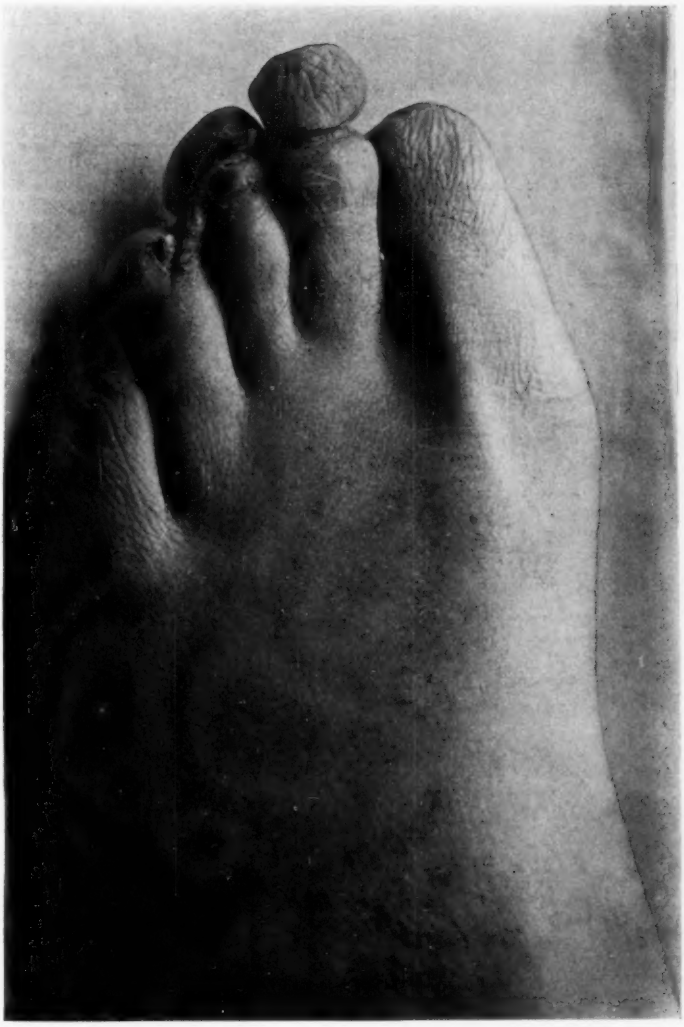
Amniotic constrictions middle and ring fingers of right hand.

FIG 5



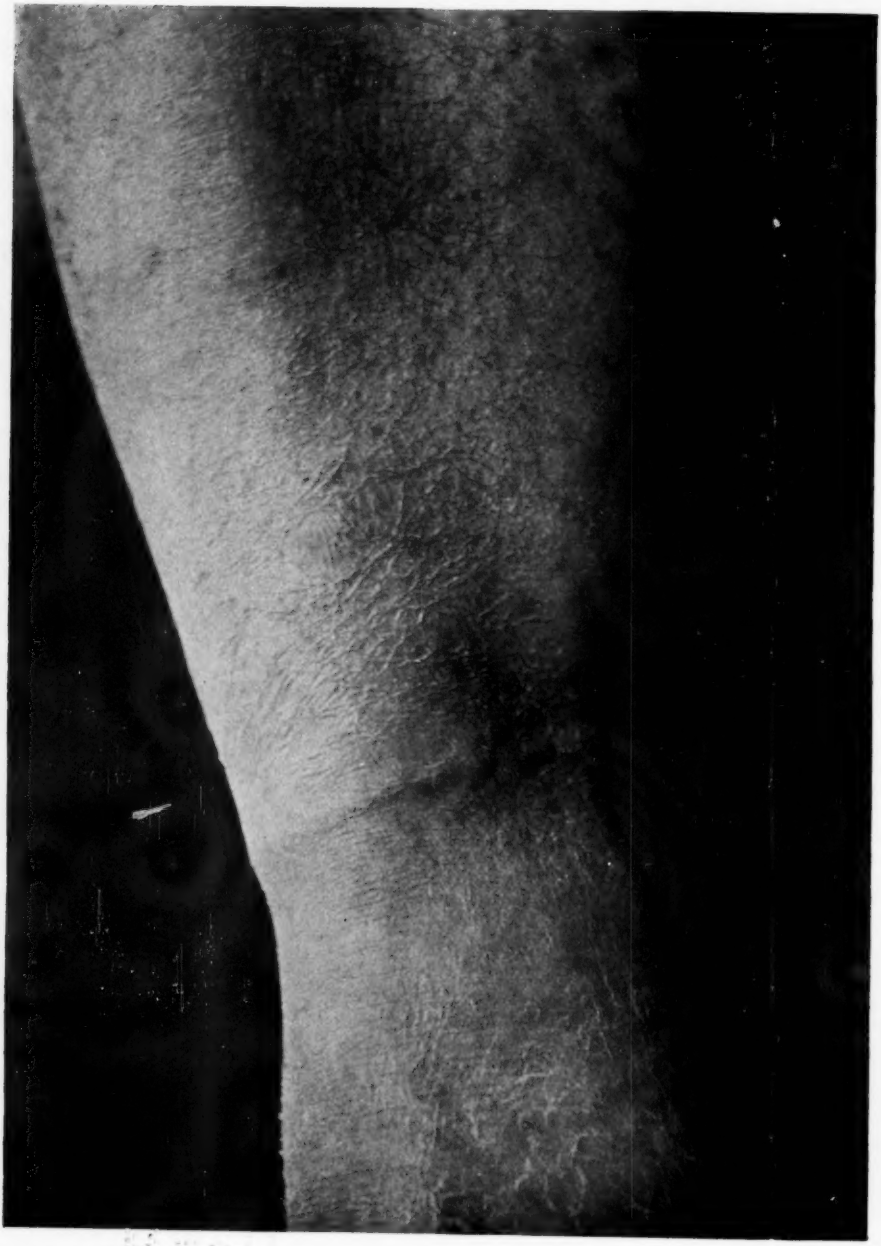
Amniotic constrictions, right foot.

FIG. 6.



Amniotic constrictions and syndactyly of left foot.

FIG. 7.



Amniotic constriction of leg.

her general health improved. At present, both the tumor in the neck and that of the sternum had practically entirely disappeared, and he did not believe that any further treatment would be necessary to effect a permanent cure.

Dr. Coley said it was worthy of special note that this patient had received the largest dose of the stronger preparation toxins within his knowledge, namely, thirty minims. The tumors continued to disappear long after the treatment was discontinued, a phenomenon that he had observed in several other cases.

INTERSCAPULO-THORACIC AMPUTATION FOR SARCOMA: RECURRENCE SUCCESSFULLY TREATED WITH MIXED TOXINS.

Dr. William B. Coley presented a girl 16 years old, who had been the subject of a sarcoma of the right shoulder-joint which was first noticed in January, 1907. She was treated for three weeks with injections of the mixed toxins, with some improvement at first, but later the tumor increased in size, and on account of the extent of the growth an interscapulo-thoracic amputation was done early last July. The subclavian vessels were partly filled with sarcomatous thrombi. There was a recurrence within three months, and in early October, 1907, the toxins were again resorted to and kept up until December 23. Under this treatment the evidences of recurrence had disappeared, and the patient had gained sixteen pounds in weight. This patient was presented before the New York Surgical Society in December, 1907.

CONGENITAL DEFORMITY OF HAND AND FEET.

Dr. Willy Meyer presented a man, 22 years old, a ship's steward by occupation, with deformities of the fingers of the right hand and toes of both feet and one leg (see Figs. 4, 5, 6, and 7). These were of congenital origin and due to amniotic constrictions. The patient entered the hospital suffering from an ulcer of the sole of the right foot, which, however, was not perforating. In its immediate neighborhood and on the dorsum of the same foot, just above the ankle, he had an anæsthetic zone about the size of a silver dollar. In this area he did not feel pain, and could not distinguish head from cold. Above the ankles there was a garter-like constriction of the leg.

The patient was being treated by Bier's hyperæmic method in the hope of inducing the ulcer to heal by improving the circulation. He had been much benefited in the two weeks of his stay at the hospital, the ulcer being almost closed.

PROLAPSE OF THE CÆCUM AFTER APPENDICOSTOMY.

DR. WILLY MEYER presented a man, 24 years old, who entered the German Hospital in the Fall of 1904 suffering from amœbic dysentery which he had contracted in Egypt. As he had been sick for some time and had been unsuccessfully treated by various methods of internal medication, it was decided to do an appendicostomy through which opening proper lavage of the lower bowel could be carried out. The operation was done through an intermuscular incision, the cæcum being pulled up to the peritoneum and the rather voluminous appendix was brought straight out through the abdominal wound. He was then treated for several months at the hospital, the bowel being regularly washed out through the appendicostomy wound with a one per cent. solution of muriate of quinine. When the patient left the hospital he was instructed how to introduce the catheter and continue the treatment, which had to be kept up for about a year before his diarrhœa ceased and his stools became normal.

When the patient again came to the hospital to have his appendicostomy wound closed, it was found that he had a prolapse of the cæcum, which had forced its way through the appendicostomy-fistula, surely an exceptional case (see Fig. 8). Dr. Meyer intends to excise the prolapse and suture the bowel.

FIBRO-OSTEOMA OF THE HUMERUS.

DR. ELLSWORTH ELIOT, JR., presented a man of 18 years, who was admitted to the Presbyterian Hospital in June, 1900, with the history that six weeks prior to admission he had fallen and struck his right shoulder. This was followed by some swelling, and the patient was brought to the hospital.

There were no evidences of fracture or dislocation. On the anterior and inner aspect of the right humerus there was a hard, fusiform mass about two inches wide and three inches long attached to the upper end of the bone. The circumference of the arm at its most prominent point exceeded that of the opposite arm by two and a half inches. The growth was supposed to be

FIG. 8.

Prolapse of cæcum through appendicostomy fistula.

a sarcoma, and an operation was advised, with the suggestion that an amputation at the shoulder or at a point even higher up might be found necessary. The boy's father consented to an operation, but refused to permit an amputation. A four-inch vertical incision was thereupon made, exposing the tumor. There was no satisfactory line of demarcation between it and the humerus, and its appearance resembled sarcoma rather than osteoma. It was removed with the chisel, leaving a thin plate of bone externally and posteriorly. This shell of bone that remained was so thin that near the end of the operation a transverse fracture occurred at the anatomical neck, which subsequently united without trouble, and without displacement.

The tumor, upon microscopical examination, proved to be a fibro-osteoma. The case is chiefly of interest because of the fact that in spite of the proximity of the bony tumor to the epiphyseal line, its removal did not interfere with the growth of the limb, nor with the subsequent restoration and function of the bone.

RIGHT-SIDED URETER CALCULUS COMPLICATING CHRONIC APPENDICITIS.

DR. FORBES HAWKES presented a man 28 years old, upon whom Dr. Hawkes had first operated on March 6, 1906, for intrahepatic calculi which were located with the X-ray. The calculi had been removed in two stages, and the patient had made an excellent recovery, his old symptoms associated with jaundice having entirely disappeared.

After leaving the hospital, on April 5, 1906, he felt well for about two months. Then he was seized with a sudden sharp pain in the right hypochondriac region, with inability to urinate. Three weeks later he had a similar attack. He then remained perfectly well and free from pain for fifteen months. Subsequently he had similar attacks, but the pain had been lower down. The urinary symptoms, however, had not been so prominent. On admission to the Presbyterian Hospital, in the service of Dr. A. J. McCosh, the patient presented marked right mid-rectal abdominal rigidity, with distinct superficial tenderness. There was no elevation of temperature nor increase in the pulse rate. The urine contained a trace of blood. The X-ray plate showed a calculus in the pelvic portion of the right ureter. A diagnosis of complicating chronic appendicitis was made on account of the superficial tenderness and the rigidity.

The patient was operated on December 12, 1907, by Dr. Hawkes, who removed the appendix through a low intermuscular incision. It was found to be the seat of a marked chronic inflammation. The peritoneum was then reflected from the abdominal wall below and to the outer side, until the ureteral calculus was reached. The ureter, together with the calculus, was then raised between the thumb and index finger, a longitudinal incision was made in the ureter, and the calculus removed. The incision in the ureter was then closed by interrupted chromic catgut sutures involving all the coats of the ureter excepting the mucous membrane. A small rubber tissue and gauze cigarette drain was placed retroperitoneally down to the site of the ureter suture and the peritoneum was closed.

The patient made an uneventful recovery, and there was no leakage from the ureter wound. He had since remained well.

RUPTURE OF THE LONG HEAD OF THE BICEPS MUSCLE AT ITS GLENOID ORIGIN.

Dr. Forbes Hawkes presented a man 38 years old, who had ruptured the long head of his biceps muscle by muscular action, tearing it away at its glenoid origin. Examination showed a bulging in the region of the belly of the right biceps, with a small sulcus above and to the right side. There was marked weakness on flexing the elbow. At the time of operation, on January 29, 1907, the entire long head of the biceps was found in the middle of the arm, curled upon itself. As it was not considered advisable to open the shoulder-joint in order to re-attach the tendon at its glenoid origin, it was grafted into the short head just below the coracoid process. The functional result of the operation was excellent. The patient said that his arm was as useful as ever, and he had returned to his work as an expressman.

TUBERCULOSIS OF THE TIBIOTARSAL JOINT.

Dr. Willy Meyer presented a girl 21 months old, who came under his care in July, 1906, for tuberculosis of the left tibiotarsal joint, with sinus formation. An X-ray picture was taken, which showed that much of the astragalus was destroyed. After a few months of hyperæmic treatment at the hands of the child's mother, who had been thoroughly instructed, sickness

amongst the other children prevented her from further proper attendance. Therefore the child was admitted to the hospital, and on December 27, 1906, the joint was resected by the Koenig method. The astragalus, which was thoroughly diseased, was removed, and the synovial membrane carefully extirpated, as well as the tuberculous granulating tissue surrounding the peroneal tendons. The joint was then filled with iodoform fluid prepared according to Mosetig, which hardened rather quickly.

The child's convalescence was retarded by an attack of scarlet fever, but she eventually made an excellent recovery, with very slight shortening. She walks with a proper shoe for the last six months, the foot being in good position.

HABITUAL DISLOCATION OF SHOULDER.

Dr. Willy Meyer presented a man 31 years old, who was admitted to the German Hospital in June, 1906, for an habitual dislocation of the left shoulder, which had resulted from a fall on the hand about four years ago.

In operating on this case, Dr. Meyer said he made an incision down to the capsule between the pectoralis major and the deltoid, and laterally incised the acromic origin of the deltoid for a distance of an inch and a half. This gave a good exposure, and brought out the anterior portion of the capsule very well, especially by pulling the coracobrachialis muscle inward. The joint itself was not opened. The capsule, which was not very much distended, was inverted toward the inner side, and stitched with a longitudinal continuous chromicized catgut suture.

Dr. Meyer said he had found this method of shortening the capsule of the joint an excellent procedure. Since the operation in this case, which was done on June 18, 1906, the man had had no further dislocation of the shoulder.

EXCISION OF THE RECTUM FOR CARCINOMA.

Dr. Willy Meyer presented two patients. The first patient was a man 49 years old, who was admitted to the German Hospital on December 1, 1906, with an ulcerating tumor just above the anus; its walls were elevated, and its upper end was just within reach of the finger. The operation done was that of Witzell-Hoffmann, combined with Gersuny's method, with the

patient in the knee-elbow position. After excision and disarticulation of the os coccyx, the presacral space was entered and the rectum freed. The sphincteric ring could not be spared. The median and inferior hemorrhoidal artery were tied primarily, thus reducing hemorrhage markedly. As in all cases of this kind, the peritoneal cavity was widely opened and after tying the mesosigmoid in portions, the gut could be well pulled down. Gauze-tampons having been placed in the peritoneal incision, the muscular coat of the gut was circularly incised and the mucous cylinder tied with catgut. Then a clamp was placed distally and the gut cut across, its lower end being stitched about three quarters of an inch below the level of the skin after having been turned for 180° according to Gersuny. The upper portion of the wound was sutured, the lower portion tamponed; good recovery. To-day the patient keeps himself clean with the help of irrigations every morning; the turning of the stump did not provide for sphincteric action. He has gained over thirty pounds in weight.

The second case shown by Dr. Meyer was a woman, 30 years old, who was operated on three and a half years ago by the Witzell-Hoffmann method. There the stumps had not been fastened in the wound after amputation and retracted behind the sacrum, a condition which later on necessitated a secondary operation on account of a cicatricial stricture. To-day this patient too is in excellent condition. By regular bowel irrigation every morning she remains clean during the remainder of the day.

EXCISION OF THE INFERIOR MAXILLA FOR CANCER.

Dr. George D. Stewart presented a man, 47 years old, who was admitted to St. Vincent's Hospital on December 13, 1907. His family and previous history was negative. Patient drinks moderately; smokes pipe excessively, always holds pipe on the left side of the mouth. Careless as to mouth sanitation. Appetite good; bowels regular; no history of injury or of venereal disease.

Patient had several attacks of neuralgia at intervals for the last seven years. About 11 weeks before admission he began to have trouble with left lower bicuspid and molar teeth; there was pain and swelling over the gums appeared. Three weeks later had three teeth extracted. About a week after extraction,

swelling increased, was painless, and the swollen gums bled easily. Went to the Dispensary and on December 8th a small piece of soft tissue was removed for diagnosis.

Examination on admission showed ulceration and swelling of the gums on left side lower jaw, slightly tender. Surface of swelling pale, skin over tumor not involved; a small gland palpable behind angle jaw.

Decemer 28, 1907.—An operation was performed through an incision, beginning behind the vertical ramus of the jaw, running downward, parallel to this ramus, to the hyoid bone, thence forward slightly beyond the symphysis menti. A flap was lifted and an enlarged gland found at the bifurcation of the carotid, was removed. Through this incision the external carotid artery was permanently ligated and a temporary ligature was applied to the corresponding vessel on the opposite side, making the operation almost bloodless. The dissection was made as complete as possible before the mucous membrane of the mouth was invaded. Later the bone was removed above the angle and slightly beyond the symphysis menti; the corresponding side of the tongue was involved and a part of it had to be removed together with the anterior pillar of the fauces. The operation was very extensive and the patient for several days could not swallow and had to be nourished by enema. After the operation, the portion of the jaw remaining, on the advice of Dr. Dunning of the New York Dental Infirmary, was wired to the upper jaw of that side, to prevent the displacement which would follow healing and contraction, and with the hope that it might later serve in some slight way to assist in mastication. The raw tissues on the inner side of the cheek were allowed in this case to adhere to the tongue; but Dr. Stewart states that in future cases of this sort he proposes to pack the wound during healing with sufficient gauze to fairly preserve the normal contour of the cheek and suggests that after healing some sort of celluloid or gutta percha splint might be worn. Another procedure which Dr. Stewart has found useful in operations of the mouth is the use of a rubber obturator made from a piece of ordinary sheet rubber, the rubber dam of the dentist, or a piece of light Esmarch bandage. Following removal of the superior maxilla, for instance, a properly shaped piece of rubber is stitched mesially to the cut edge of the palate, laterally to the cut edge of the buccal mucous

membrane. The packing may be both placed and removed through the anterior naris on the diseased side. The rubber obturator not only renders the packing more effective but prevents its dislodgement by the patient's tongue during recovery from anæsthesia and afterwards. The stitches may be so placed that when it is desired to remove the rubber, by cutting at one point on either side the whole line of suture may be removed. This manœuvre is of course most useful in the cases mentioned, removal of the upper jaw, but it may be applied where there is extensive loss of mucous membrane following any mouth operation.

This case was presented to emphasize the following points: (1) The value of temporary ligatures; (2) the importance of keeping the remaining fragment of lower jaw properly apposed to the superior maxilla; (3) to suggest the use of the rubber obturator; (4) to propose an attempt to avoid the subsequent deformity.

Dr. Stewart, in reply to a question as to whether the wiring of the fragment of the lower jaw to the upper was only a temporary expedient or was intended to be permanent, said the wiring was only to be left there until the tissues had ceased to contract; otherwise, the right lower maxilla would be drawn toward the operative side. He had instructed the patient to make an effort to keep as much control over the remains of his lower jaw as possible, and to use it in mastication.

CARCINOMA OF THE CHEEK: NO RECURRENCE AFTER THIRTEEN YEARS.

Dr. George D. Stewart presented a man 69 years old, who was operated upon by Dr. Stewart thirteen years ago for carcinoma, which began in the cheek and invaded the lower jaw near the angle. A section of the cheek was first excised. Recurrence took place promptly invading the mucous membrane and the periosteum of the lower jaw. At a second operation the body of the inferior maxilla was cut across about half way between the angle and symphysis and the smaller fragment was disarticulated.

This patient remains cured after thirteen years, and is presented for this reason, and to show the marked and distressing deformity which has followed the operation.

Dr. William B. Coley, referring to the period of immunity after operations for sarcoma of the lower jaw, recalled three cases

in which the recurrence took place after five, ten and seventeen years, respectively. In the latter case the original operation was done by Dr. D. Hayes Agnew seventeen years ago for sarcoma, while the recurrent tumor was a carcinoma.

COMPLETE THYROIDECTOMY.

DR. GEORGE D. STEWART presented a girl 18 years old, who was admitted to St. Vincent's Hospital on January 19, 1908, suffering from a tumor situated in front of the hyoid bone and the upper part of the thyroid cartilage. The tumor which was something over 1 inch in transverse and 1½ inch in vertical diameter had been noticeable since the patient was seven years old; had never given any symptoms, but had been increasing in size for the last two years. Because of its location it was thought probable that the tumor was a cyst of the thyroglossal duct.

January 25, 1908.—Through a median incision to avoid scarring, the tumor was removed. It was easily isolated from the sides and below, and in these directions there appeared to be no important vascular connection. Above on either side a small vessel, which suggested the superior thyroid vein, was supplied to the tumor. There was no suggestion in the shape of lateral lobes. Taking into account these facts, it appeared to be almost certain that the tumor was not of the thyroid itself and that the preliminary diagnosis was correct. After the two vessels referred to were ligated the mass remained attached by a very slender pedicle in front of the hyoid bone, while manipulating the tumor with great care so as to completely remove the supposed persistent duct, the remaining attachment gave way. Fearing that it might represent the entire thyroid gland, the incision was extended downward in front of the trachea but no structure resembling the gland was found.

On microscopic examination, made by Dr. Harlow Brooks, the tumor turns out to be of typical thyroid structure; the acini filled with colloid material, that is, the case is one of cystic goitre, and the tumor represents the thyroid gland.

Eighteen days have already elapsed since the operation. Patient's health remains perfectly good, suggesting the existence of an aberrant gland. It was suggested by Dr. Rogers and others that the gland removed possessed little if any functional value.

DR. JOHN ROGERS, in referring to the apparent absence of

thyroid gland in the case reported by Dr. Stewart, and the possibility of symptoms developing in consequence, said that no definite time could be fixed for the development of these symptoms although they usually appeared soon. The longest period on record, so far as he knew, was three years. A comparative study of the thyroid gland in the lower animals was very interesting. The horse and the goat possessed two lateral lobes connected by a mere strand of fibrous tissue, while the fox terrier had a gland very similar to that in man and with a large isthmus.

The specimen shown by Dr. Stewart represented the thyroglossal duct, and the inference to be drawn was that the case was one of two lateral lobes of the gland lying between the trachea and œsophagus, one on each side, with a persistent thyroglossal duct leading upward toward the foramen cæcum. The connection of this thyroglossal duct with one or both lateral lobes probably existed but was not noticed. Considerable thyroid tissue may exist in this duct in any part of its course. Here the remnant in front of and above the thyroid cartilage has undergone cystic degeneration. The lateral lobes probably lie, as in the horse, goat and sheep, between the trachea and œsophagus, and escaped observation in the absence of the isthmus. If they did not exist it is not reasonable to expect that the patient could.

Dr. Willy Meyer mentioned two cases of cyst of the thyroglossal duct that had come under his observation. In one concerning a man, there was a closed cyst which covered the anterior part of the neck and passed behind the hyoid bone, and its extirpation necessitated the removal of the anterior part of the bone. The other case was in a child, five years old, with a small fistula of the neck, which at times closed and then reopened, discharging the usual fluid. The child showed an apparent lack of development, and there was a regular slight evening rise of temperature. Upon operation, a retention cyst of the thyroglossal duct was found, which was grasped with forceps and entirely removed. The upper part of the sac again ran up beneath the hyoid, from where it could be nicely removed by pulling this bone up with a sharp bone-hook. Both patients made a good recovery.

HYPOSPADIAS.

Dr. Alexander B. Johnson presented a boy of 16 years, who came under Dr. Johnson's care about two months ago for

penile hypospadias. The penis was curved to a marked degree, and in order to correct the deformity, the well-known operation of Beck was done. The urethral orifice was dissected out, leaving a narrow skin border. The ventral surface of the penis was then split, and the corpus spongiosum dissected free from the corpora cavernosa as far back as the bulb. The glans penis was then perforated from behind forward with a knife, and the meatus urinarius established in its normal situation. The urethra was then drawn through the slit in the glans and sutured to the edges of the new formed meatus. The central wound in the skin was united with sutures. The patient had to be catheterized for about a week after the operation. The result of the operation was very satisfactory. He still had slight curvature of the organ on erection, but this was gradually disappearing, and he was now able to urinate through the normal meatus with great comfort.

THE OPERATIVE TREATMENT OF INTRACTABLE VOMITING, NOT DUE TO PYLORIC OBSTRUCTION. NEUROSIS OF THE STOMACH.

DR. WILLY MEYER read a paper with the above title for which see page 730.

DR. JOHN B. WALKER said he recently saw a woman, 55 years old, who came on here from the West complaining of gastric pain and vomiting. She was supposed to have a gastric ulcer or growth, but upon opening the stomach, nothing was found. She was assured that she had been relieved of her trouble, and within a month after the operation she was able to eat three meals a day without causing pain or vomiting, and she had gained about eight pounds in weight. The case was apparently one of neurosis of the stomach.

DR. MEYER, in closing, said that contrary to the usual dictum laid down in the text-books, he believed that intractable cases of so-called neurosis of the stomach should be operated on. After other methods of treatment had been ineffectually tried, a laparotomy was clearly indicated. The surgeon should not be induced, however, by his failure to find anything in the stomach, to do a gastro-enterostomy, because that procedure, as experience had shown, made matters more serious. A gastro-enterostomy should only be done when it was clearly indicated.

BULLET REMOVED FROM CRANIAL CAVITY.

DR. WILLY MEYER reported this case and showed the specimen.

The patient was a man who was injured with a 32-calibre bullet on June 30, 1906. The wound of entrance was in the right temple, and the bullet evidently crossed both olfactory bulbs and injured both optic nerves, as there was total loss of smell and sight. The patient slowly recovered from his wound, and subsequently complained of severe headaches and frequent pains in the regions of the left temple. He had no convulsions.

A number of radiographs were taken by Dr. E. W. Caldwell, which located the bullet on the left side of the skull, immediately behind the orbit and probably in the middle fossa. After consultation, an operation was decided on, and this was performed on July 1, 1907. The ordinary flap operation was done, with the help of Doyen's grip and Gigli's saw, similar to that for removal of the Gasserian ganglion. Upon turning back the flap, the dura was found to be very adherent to the bone, but could gradually be pushed off the base with gauze tampons held by clamps. The bullet was found in the middle fossa, as had been shown by the X-ray. It had worked its way into the larger wing of the sphenoid, and was adherent to the dura mater and the brain. It was removed, together with a few bone-splinters, and a small gauze drain, plus a rubber gutter, was inserted through the lower trephine opening, while a second rubber drain was inserted through one of the upper drill holes. The patient made an uninterrupted recovery from the operation, and left the hospital nine days later. The operation had relieved him from his headaches, although, of course, it had had no effect upon the loss of smell and sight.

DR. E. W. CALDWELL, who had done the radiographic work in the case reported by Dr. Meyer, said that the two plates exhibited gave a pretty good idea of the location of the bullet. The important thing was to determine whether it was within or without the cranial cavity. The stereoscope was of assistance in determining that point, and it was decided, after considerable study, that the bullet lay within the great wing of the sphenoid, where it was subsequently found.

ROUND-CELLED SARCOMA OF THE DORSAL SPINE.

DR. VIRGIL P. GIBNEY and DR. WILLIAM B. COLEY reported this case, and presented the pathological specimen.

The patient was a married woman, 42 years old. She had had nine children, seven of whom were living. When she was admitted to the Hospital for Ruptured and Crippled, on November 29, 1907, she stated that her general health had always been fairly good, although she had had epilepsy in infancy. Her father had died of paralysis; her mother of old age.

In March, 1907, during the night, patient was suddenly taken with pain in the left shoulder; this lasted for two months, always being especially severe at night. In June the right shoulder began to be painful; the pain on this side being also more severe at night. The pains continued intermittently up to the present time; there has been moderate loss of weight; no night sweats, gradual failure in strength, the patient getting easily tired. She has had nothing but internal treatment. She was admitted from the Out-patient Department with the diagnosis of abscess from Pott's disease, December 2, 1907. She came to the hospital without apparatus, walked with difficulty; gait very unsteady; eyes normal; round shoulders of moderate degree. Outline of vertebræ indefinite due to bogginess and swelling in mid-scapular region. Palpation shows a fairly symmetrical swelling 6 inches in diameter, projecting from 1–2 inches beyond the normal surfaces. The admission history states that there is "distinct fluctuation over a large area over vertebral border of left scapula, the size of the palm of the hand, superficial to and not communicating with the bone. There is a small area with fluctuation on the right side, half the size of a hen's egg, opposite the mid-dorsal region. Between these two areas of fluctuation there is a peculiar bogginess. Slight tenderness over the spinous process of sixth and seventh dorsal vertebræ; slight pain in the back; no rigidity. Sensation in lower extremities is diminished slightly, especially on anterior surfaces; there is also slight loss of motor power; incontinence of urine for the past 48 hours combined with incontinence of feces; knee-jerks active. Dorsal flexion of all the toes to plantar irritation; ankle clonus not elicited." Fluctuating areas were aspirated four times, bright blood flowing rather freely at each aspiration.

After admission to the Hospital, more careful examination of the swelling together with the negative results of aspiration led to the conclusion that the woman was suffering from a highly vascular round-celled sarcoma, the soft tissues of which closely simulated fluctuation. This diagnosis was confirmed by exploratory incision done on December 6th. A vertical incision, 2 inches long, was made over the tumor in the back opposite the seventh and tenth dorsal vertebræ, 2 inches to the left of the median line. On pushing aside the fascia and muscles, a distinct tumor of dark red color, of the size of a small orange, was found attached to, and apparently originating in the vertebræ, the base of the tumor involving the sixth-tenth vertebræ. The tumor was exceedingly vascular and it was believed unwise to make any attempt to remove it, except a portion (about the size of a hickory nut) for pathological examination. Hemorrhage was very free, but was controlled by tight packing of the wound. December 8 the patient showed some shock following the operation; the paralysis of the lower extremities as well as bladder and rectum became complete. She complained of a great deal of pain in the back, and sitting half propped up with back rest, is the only position that gives her comfort.

Blood count:

R.b.c.	4,200,000	Lympho	31 per cent.
W.B.c.	11,000	Eosin	5 per cent.
Hgbn.	75 per cent.	Transit	1.5 per cent
Pol.	67 per cent.	No nucleated reds	

Small doses of the mixed toxins were begun on the 8th; ¼ m.m. doses were followed by no chill, but slight rise of temperature and pulse. The toxins were given in fractional doses for a few days, seven injections in all, but in view of the great weakness of the patient it was thought advisable to discontinue them.

Dr. Jeffries' report (December 11, 1907) pronounced the growth a small round-celled sarcoma.

December 24.—The site of the incision became broken down and sloughing, a large bed-sore developed in sacral region, gangrene on both heels, marked respiratory distress; retention of urine and feces. The patient continued to decline steadily and died on January 2, 1908, one month after admission.

FIG. 9.

Sarcoma of the dorsal spine.

The autopsy report by Dr. Jeffries reads as follows:

"A growth was attached to the spine and involved the first five dorsal vertebræ. A second growth was found beneath the left scapula. Over this second growth was a circular opening or ulceration of the skin about 3½ inches in diameter with the growth protruding through the opening. There was a marked dorsal angular curvature. No other superficial lesions were observed.

Upon removal of the sternum, the heart and pericardium were found to be normal. The right lung was normal, except for an abnormality of development, in that there was but one lobe, there being but slight indication of an attempt to divide off the lower lobe from the middle. No such indication was observed at the junction of the upper and middle lobes. The left lung had also but one lobe and here also there was apparently no effort to divide. In this lung was a tumor the size of a man's fist involving the upper and median aspect of the apex and involving also the bodies of the adjoining vertebræ. This growth had to be severed to remove the lung. The tumor then could be seen to involve the third, fourth and fifth dorsal vertebræ (Fig. 9). It could be seen slightly protruding into the right pleural cavity but had left the pleura uninvolved. On the left side it followed along and between the ribs at that side. The last cervical and first dorsal vertebra were removed and after sawing through the bodies and processes of these bones the tumor was found protruding into the vertebral canal. This mass was about the diameter of the cord at this point and was 2 inches long.

The liver was enlarged and firm and was undergoing fatty degeneration and was in a state of moderate congestion. The kidneys were markedly enlarged and were undergoing fatty and parenchymatous degeneration, and as in the liver there was marked congestion. The spleen was not enlarged, was firm and plum colored. The pancreas was normal. No other growths were found."

In this case the duration of the disease from the first symptom to death was only nine months, the shortest span for a sarcoma of the spine in our own experience and, as far as our reading goes, of all reported cases.

The general condition of the patient was so bad and the

disease progressing so rapidly, that the toxins, at least in the doses that the patient could bear, had little or no effect.

The reporters stated that they had observed one other case of sarcoma of the spine in which the condition at the time of the beginning of the treatment was more desperate than in the present case, although the disease was of slower growth. This was the case of a young man 20 years of age, with an enormous tumor involving the lower dorsal and upper lumbar vertebræ. The patient had lost about 50 pounds and the pressure upon the spine had caused total paralysis of the lower extremities, bladder and rectum. The diagnosis of round-celled sarcoma was confirmed by Dr. Harlow Brooks pathologist of the Bellevue Hospital. Under four months' treatment with the mixed toxins of erysipelas and bacillus prodigiosus, at the Montefiore Home for Incurables, the patient entirely recovered and is now in perfect health, six years later. This patient was presented to the New York Surgical Society in 1907.

Dr. Coley has observed another case of spindle-celled sarcoma of the vertebra which recovered under the toxin treatment and was well when last heard from, ten years later. In this case there was no paralysis.

IRREDUCIBLE INGUINAL HERNIA COMPLICATING SARCOMA OF THE TESTIS.

Dr. William B. Coley showed a fresh specimen removed from a case where he had been called upon to operate for an irreducible inguinal hernia. He found a large omental hernia which upon operation was easily reduced. On looking into the scrotum he found a tumor which upon aspiration proved to contain blood. He made the clinical diagnosis of sarcoma and thereupon removed the tumor, which he regarded as either a round-celled sarcoma or possibly teratoma.

(Note).—The pathological examination proved the tumor to be a small round-celled sarcoma.

The patient has had no symptoms other than those of hernia.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, February 3, 1908.

The President, Dr. William J. Taylor, in the Chair.

EXCISION OF THE CLAVICLE WITH PERFECT FUNCTIONAL RESULT.

Dr. James K. Young presented a girl, 11 years of age, who fell in the school yard on January 30, 1907, injuring the left knee. The following day she had a high temperature and great prostration which continued until four days later when she had a hemiplegia of the left side. The knee continued painful but there was no swelling until the end of six weeks, when it swelled suddenly and to a great degree. A small pustule formed on the anterior surface and was opened and drained by the attending physician, and a drainage-tube was inserted. A slough occurred over the left clavicle which extended until the central third of the bone was fully exposed. The lower part of the neck and face also became enormously swollen and for three or four days she could not move her head. Pieces of bone were discharged from the right side of the inferior maxilla within the mouth.

On July 11, 1907, she was admitted to the Polyclinic Hospital under the care of Dr. Young. The pus discharging from the wounds at this time showed the presence of Staphylococci pyogenes aureus, and a diagnosis of osteomyelitis was made. On September 20th, 1907, the clavicle still being exposed and it being impossible to close the wound, the entire clavicle was removed subperiosteally. The specimen examined in the pathological laboratory of the Polyclinic by Dr. James A. Kelly, Pathologist, showed an acute suppurative condition of the medullary cavity and osseous structure. The proximal extremity of the right clavicle was also removed.

Both wounds healed by granulation, and the X-ray taken January 31, 1908 shows a regeneration of the clavicle. The functional use of the part is remarkable but corresponds with what has been described by other observers where after removal of the clavicle the function of the shoulder has not been materially changed.

MALIGNANT ULCER OF ORBIT.

Dr. Warren Walker presented a woman, thirty-five years of age, who came to the surgical dispensary of the Episcopal Hospital for treatment in the first week of December, 1907, giving the following history: married for nineteen years; has three healthy children; has had two miscarriages during past year; smallpox at four and abscesses of neck following typhoid five years ago.

Present condition began eighteen months ago with a small sore at left inner canthus which gradually increased in size. There was a clear watery discharge; no blood. The growth has within the past three months ulcerated into the nasal cavity and destroyed the muscles on the inner side of the eyeball. She has no pain but suffers from severe headaches. She was put on K. I. and inunctions of mercury, and the wound appeared to be slowly granulating when she developed a nephritis and treatment had to be stopped.

NON-ABSORBABLE LIGATURES AND SUTURES.

Dr. Oscar H. Allis read a paper entitled The Non-absorbable Ligature and Suture, for which see page 758.

GERMAN HOSPITAL SURGICAL CLINICS.

Dr. John B. Deaver read a "Report of the Saturday Surgical Clinics for Students at the German Hospital during 1906–07," for which see page 761.

FRACTURE OF THE PROXIMAL END OF THE FIFTH METATARSAL BONE.

Dr. Henry R. Wharton reported the following cases:

Case I.—W. A. G., aged 45 years, in jumping from a wagon in a runaway landed upon his right foot and found he had pain and difficulty in walking. On the third day after the accident, and as the foot was still painful and interferred with walking,

he consulted Dr. Wharton, who found on examination that there was marked swelling over the proximal end of the fifth metatarsal bone, and great tenderness upon pressure of this portion of the bone. An X-ray examination showed that there was a fracture through the proximal end of the bone. A plaster-of-Paris bandage was applied for two weeks, and upon its removal, as the tenderness had disappeared, strapping and a bandage were applied, and he was able to walk comfortably with the aid of a cane. Two weeks later he was able to discard all dressing and walk without difficulty.

CASE II.—E. B., aged 10 years, while skating upon roller skates ran into the curbing and fell, twisting her foot. She immediately experienced pain in the outer portion of left foot and walked with great discomfort. Dr. Wharton saw her within an hour of the accident, and found a distinct swelling over the proximal end of the fifth metatarsal bone; this region was also extremely tender upon pressure. An X-ray examination on the following day showed a fracture passing through the proximal extremity of the bone. A plaster-of-Paris bandage was applied for two weeks, and upon its removal strapping and a bandage were applied, and the patient walked without difficulty.

CASE III.—J. C., aged 10 years, received a wrench of the foot while playing foot ball. He applied to the Dispensary of the Children's Hospital on the following day, complaining of pain in right foot, and difficulty in walking. Upon examination there appeared swelling of the tissues, and tenderness on pressure over the proximal end of the fifth metatarsal bone of the right foot. From the symptoms presented, which were exactly similar to the two cases reported above, Dr. Wharton thinks he had the same variety of fracture. Dr. Wharton further remarked that fracture of the shaft of the metatarsal bone is not an uncommon accident, and is said to be most common in the first and fifth metatarsal bones. The special variety of fracture reported in the above cases, the accurate diagnosis of which is impossible without the aid of an X-ray examination, does not seem to have been described by surgical writers. Hamilton speaks of fracture of the first and fifth metatarsal bones as most common, but makes no mention of fracture of the proximal end of the bone. Scudder mentions the greater susceptibility to fracture in the first and fifth metatarsal bones, and shows a skiagraph of a transverse fracture of the fifth

metatarsal bone near its proximal extremity. Von Bergmann mentions a condition formerly described as tumor of the foot which was not uncommon in soldiers who made long marches carrying heavy weights. Bruthaupyt, Schentze, Kocher and others, with the aid of X-ray examinations, have shown that this condition is usually due to a fracture of the second or third metatarsal bone. It is probable that the systematic X-ray examination which is now so generally employed in fractures, will show that it is a comparatively frequent injury.

Fracture of this portion of the bone is probably of the nature of a sprain fracture, the fragments being separated by the ligamentous slips from the dorsal or plantar ligaments which attach it to the cuboid. Displacement of the fragments seems slight.

The treatment which seems most satisfactory is the application of a plaster-of-Paris dressing for a few weeks, or firm strapping and a bandage, which is followed by good use of the foot in from three to four weeks.

Dr. James K. Young wished to place on record a case in which union did not occur. This was verified by X-ray examination. In this case the distal end of the fifth metatarsal bone was first removed. This did not relieve the metatarsalgia, and therefore the distal end of the fourth metatarsal bone was removed. This gave some relief to the patient, and no other operative treatment was undertaken. Dr. Young simply wanted to show that the treatment advocated by Dr. Wharton is not always satisfactory in producing union in fracture of the fifth metatarsal bone.

MULTIPLE FRACTURE OF THE LOWER JAW TREATED WITH AN INTERDENTAL SPLINT.

Dr. Henry R. Wharton reported the case of a man, aged 24 years, who received an injury of the lower jaw probably by a blow from a blackjack. He came under the operator's observation upon the following day, when it was found that there was a small lacerated wound of the left cheek which did not communicate with the mouth, and there were also two fractures of the body of the lower jaw, one on the left side just in front of the wisdom tooth, the other on the right side near the mental

FIG. 1.

X-ray showing fracture of proximal end of fifth metatarsal.

FIG. 2

X-ray showing fracture of proximal end of fifth metatarsal.

foramen. The bone between these two lines of fracture was displaced downward, several teeth were loosend, and one had been knocked out near the fracture on the right side of the jaw. It was found by manipulation that the fragment could be replaced, but even with a compress and Barton's bandage it could not be kept in position so that the teeth could be made to articulate.

An X-ray examination made with the compress and Barton's bandage applied showed that distinct deformity still existed, and it seemed that satisfactory correction of the deformity could only be obtained by wiring the fragments or employing an interdental splint, and Dr. Gritman, of the Dental Department of the University of Pennsylvania, made casts of both jaws, and from these casts metal moulds were made upon which the splint was shaped. The most difficulty in fitting the splint was due to the fact that the only retaining point posterior to the fracture on the left side of the jaw was a partially erupted wisdom tooth.

The interdental splint was applied on the fifth day after the injury, and the jaws were firmly held in contact with the splint by means of a Barton's bandage. An X-ray examination at the end of a week showed that the displacement of the fragment had been corrected and the articulation of the teeth was perfect. The splint was removed at the end of five weeks, and the articulation of the teeth was found perfect, but as the union at the seat of the fracture was not quite firm, it was re-applied for two weeks longer, making seven weeks in all that it was worn. Even at this time it did not seem safe to remove all retentive apparatus, so the patient wore through the day a light Barton's bandage, and was not allowed to use the jaw in mastication, and at night he re-applied the splint, to guard against any violent involuntary movement of the jaw during sleep. The patient during the whole course of treatment was kept on liquid nourishment.

The result obtained was an excellent one, there being absolutely no deformity and the articulation of the teeth being perfect.

Dr. George M. Dorrance (by invitation) said he had had during the past year 77 cases of fracture of the jaw, 23 of which he had treated with intermaxillary splints or interdental splints. Some were treated by the so-called Angle method, which really does not belong to Dr. Angle; others with the Matas splint, which he modified somewhat; and others with the Barton bandage. Reviewing all these cases he thinks the Barton bandage should

be discarded absolutely. In cases where it is impossible to obtain the interdental or intermaxillary splints the Angle or Dorrance modification of Matas' method give most satisfactory results. In speaking of results one takes the articulation of the teeth, not their alignment. If a fracture is within the line of the teeth all that is needed is an interdental splint which covers over the lower teeth. The patient can open his mouth, talk, and eat semi-liquid food. In every one of the 23 cases in which Dr. Dorrance used the intermaxillary or interdental splint he has perfect articulation. In those in which the Angle method was used he had some failures because the application was not correct, or because of the slipping of the two bands which go around the teeth. The Angle method consists of a band around the upper teeth and a band around the lower teeth; between these two there is a rod which is held in place by a clamp around the band on the upper teeth, and again by a clamp on the lower teeth. This holds the lower jaw against the upper. It is easily applied by a surgeon; but an interdental splint should be applied by a dentist. Dr. Dorrance has treated 3 cases of fracture of the upper jaw with the interdental splint. The jaw is immediately reduced and a cast taken; this will undoubtedly show some deformity; then another cast is made and a die is made of that, and finally a German silver die is wedged over the copper one. This silver splint is placed on the teeth by cement and fracture is in perfect position, and the patient can eat food he does not have to chew. The results from the intermaxillary and interdental splints have proven most satisfactory in every respect.

CASES OF FRACTURE OF THE PATELLA TREATED BY OPEN OPERATION AND SUTURE OF THE FRAGMENTS.

Dr. Henry R. Wharton reported the following cases:

Case I.—W. R., aged 23 years, in December, 1907, while fox-hunting, fell with his horse and received an injury of the left knee. A temporary dressing was applied and the patient was removed to the Presbyterian Hospital.

Upon the third day after the injury the patella was exposed by a transverse incision over the knee-joint, and a very large amount of blood-clot was removed. Examination of the fracture showed that there were three fragments, the upper fragment

consisting of two pieces, the smaller one to the left side was held by a periosteal hinge. The upper and lower fragments were drilled and were brought into apposition by several strands of chromicized catgut passed through the drill holes and secured by tying. After securing the fragments two additional layers of chromicized catgut sutures were employed to approximate the periosteum and capsular structures, and a third layer of silkworm gut sutures were employed to approximate the connective tissue and skin. A small cigarette drain was introduced at the angle of each wound before the capsular structures were closed by sutures. The wound was covered by a gauze dressing, and a plaster-of-Paris dressing was applied to the limb from the toes to the groin, with provision for strapping when dressing of the wound became necessary. The small drains were removed on the third day, and the sutures were removed on the tenth day, and the wound was found healed.

The plaster-of-Paris bandage was removed at the end of a month, and gentle passive motion of the joint and massage of the limb were practised. The patient was allowed to walk on crutches at the end of six weeks. Motion of the joint gradually improved, and at the end of ten weeks he walked with a cane. The function of the joint gradually returned, and six months after the injury he apparently had full extension and flexion of the joint. An X-ray taken eleven months after the injury shows the condition of the patella.

CASE II.—Mrs. M. R., aged 60 years, tripped upon a rug and fell, fracturing the right patella.

She was removed to the Presbyterian Hospital, and upon the third day after the injury the patella was exposed by incision, and the fragments and capsular structures were approximated, as in the case previously described. The dressing applied and the after-treatment were similar to that described above. The result obtained was very satisfactory, and at the end of six months motion of the knee-joint was almost perfect.

CASE III.—Mrs. R., aged 45 years, in August, 1906, fell downstairs, doubling her right knee under her, sustaining a fracture of the right patella. She was sent to the Presbyterian Hospital and was under the care of Dr. Hodge, who exposed the fragments by incision and approximated them by suture of

the capsular structures. The patient did well and was discharged with good union of the fragments. She states that she regained normal use of the limb.

On February 12, 1907, she stepped upon a piece of ice and fell, fracturing the same patella. She was admitted to the Presbyterian Hospital on February 18th, and the fragments were exposed by a longitudinal incision. It was found that union of the fragments had occurred by isolated bony areas, five or six in number, the intervening union being fibrous. The edges of the fragments were freshened, drilled and approximated by a few strands of chromicized catgut. The periosteum and capsular structures were next approximated with chromicized catgut sutures, and the skin and connective tissues with silkworm gut sutures. The limb was put up in plaster, and the case made a good recovery, and was discharged from the hospital on March 3, 1907.

An examination of this patient within a few weeks, shows that she walks without a limp, and has regained full function of the knee-joint.

OSTEOPLASTIC RESECTION OF THE SKULL.

Dr. A. C. Wood exhibited "An Instrument for Performing Osteoplastic Resection of the Skull," and read a paper upon the subject, for which see page 645.

Dr. John B. Roberts said he was very much interested in trephining instruments and had employed Stellwagen's and others. He showed last September at the State Medical Society a device of his own which he thinks is good; the instrument is simply the segment trephine, a modification of the old-fashioned trephine. He has never made use of the Cryer instrument, run by a surgical engine, although he believes it to be one of the best instruments obtained if the power is run by a practised and competent man. It is, however, very much more expensive than most individuals can afford. The price of his modification of the old-fashioned trephine he believes to be only a few dollars. Dr. Roberts thinks Fetterolf's nasal septum rasp an exceedingly good tool to cut the hinge of the flap made by the segment trephine in osteoplastic resection of the skull.

Dr. Thomas C. Stellwagen (by invitation) said that Dr. Wood had overcome most of the difficulties that the surgeons had in the use of his instrument through his modifications. When

this instrument was first used the great trouble was that the pressure was put on the saw; they did not let the saw act with its own weight, and this pried the centrepiece away. Afterwards a plate was made to screw into the bone, which largely overcame the difficulty. This however required

FIG. 1.

extra time and so necessitated a little longer time in the operation. Dr. Stellwagen does not recall in some fourteen cases trephined in which he assisted, any case where there was an injury to the dura. He does not think the dura will be injured if ordinary care is taken in terphining. It may be scratched but he has

FIG. 2.

never seen a case where the dura was cut through. Another advantage of the plate is that it controls hemorrhage from the central portion of the flap and keeps it from being torn from its attachments. In one case which Dr. Stellwagen attempted to trephine for Dr. Deaver at the German Hospital the hemorrhage was so great that it was necessary to stop.

Dr. Stellwagen said he thought there was one suggestion which might be made regarding Dr. Wood's instrument to make it practical for the average surgeon. Instead of having an ordinary smooth tip to let into the bone, have it screw in, and then it will be held more firmly and will overcome entirely the danger of the point being pulled out. He thought Dr. Wood's objection to the instrument in that it tired the wrist, was a proper one.

Dr. Stellwagen referred to a case in which it took about twenty-eight minutes to get the osteoplastic flap up. He afterwards helped in the autopsy on this case and it took him about one hour to remove the calvarium.

Dr. Stellwagen has seen a good many men try to use the surgical engine, and he thinks unless they are especially trained in its use it is a very dangerous instrument. He does not think the general surgeon has either the time or the inclination to become proficient with such a complicated instrument; it further runs so rapidly that it dulls the sense of touch.

Dr. Stelwagen's own instrument was devised in 1903.

Dr. Charles F. Nassau referred to a demonstration given upon the cadaver before the Academy some years ago by Dr. Hopkins, who used an instrument which in principle was exactly like the one presented by Dr. Wood, except that it was very much larger, and Dr. Hopkins employed a fixation apparatus of different character.

Dr. A. C. Wood, in closing, said in regard to cutting the base of the bone flap, referred to by Dr. Roberts, that he had a model of a saw to fit his instrument for that purpose. Dr. Wood does not employ this method as a rule, but simply fractures the base.

In regard to the instruments run by power, such as the Cryer instrument, Dr. Wood admits that they are very satisfactory when they work well but they have one great disadvantage which must always be borne in mind—they have great power for harm. He believes a great many operators can report a long series of cases without a serious accident, but such accidents do occur. In the circular-saw type, he has heard of the saw breaking loose from the handle and being thrown with great force. If the power instrument while in operation catches a fibre of gauze or other material it may be at once jerked from the hands of the operator who is powerless to control it.